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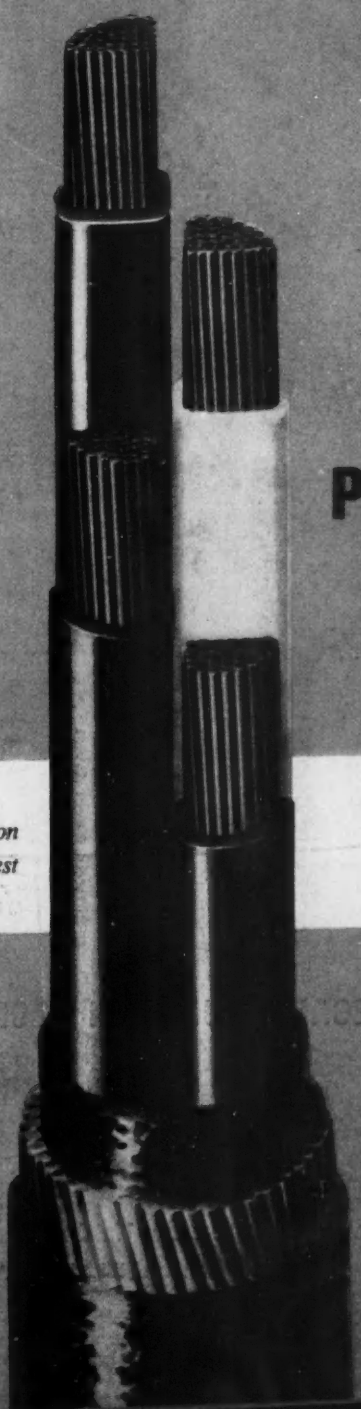
ELECTRICAL TIMES



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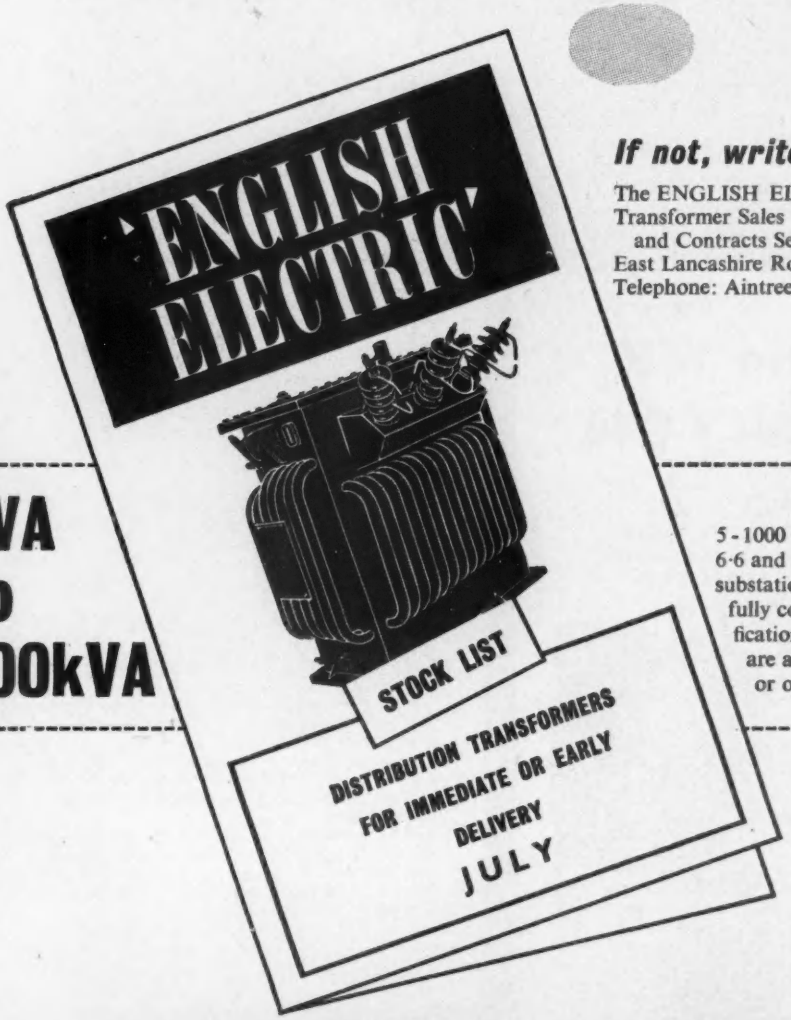

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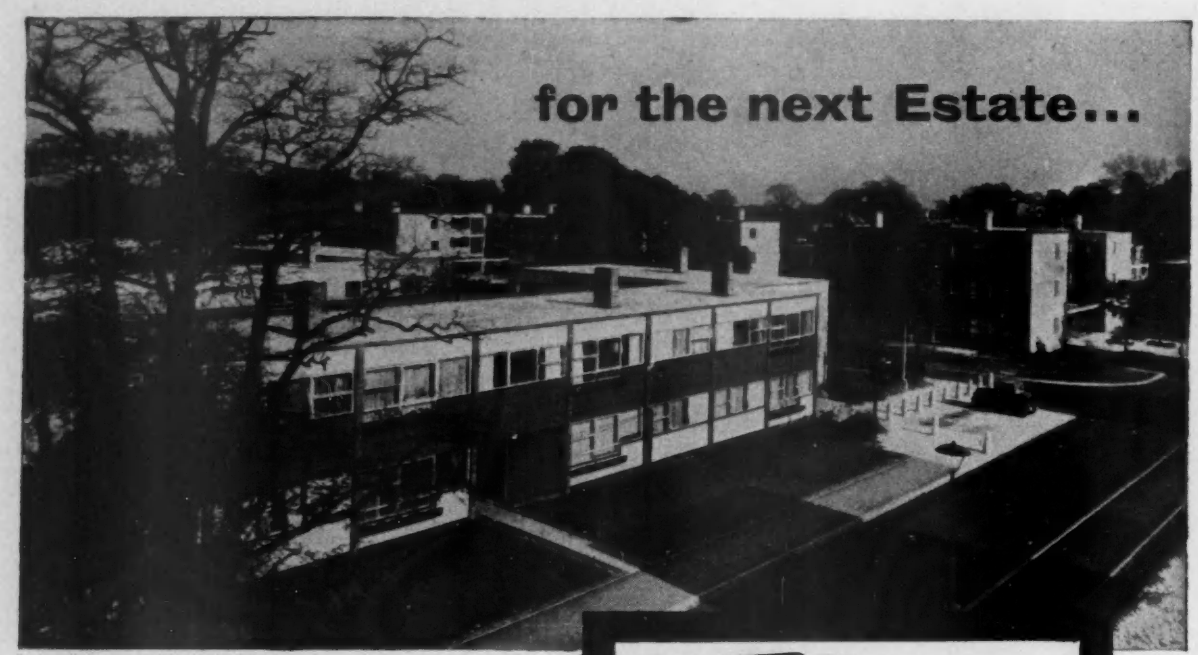

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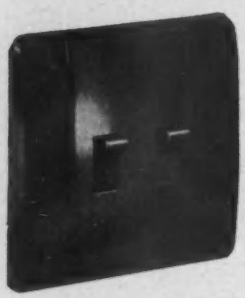
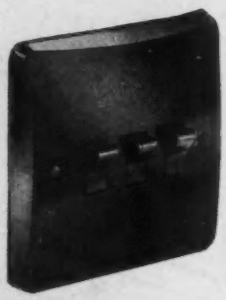
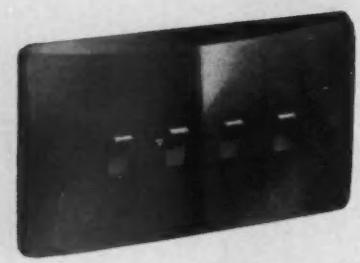


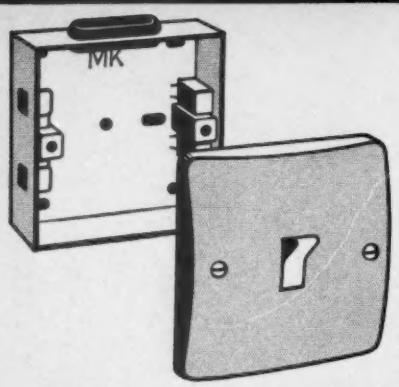
List No. 4822
Two gang with 2⅜" fixing centres.



List No. 4833
Three gang with 2⅜" fixing centres.



List No. 4824
Four gang with 4¾" fixing centres.



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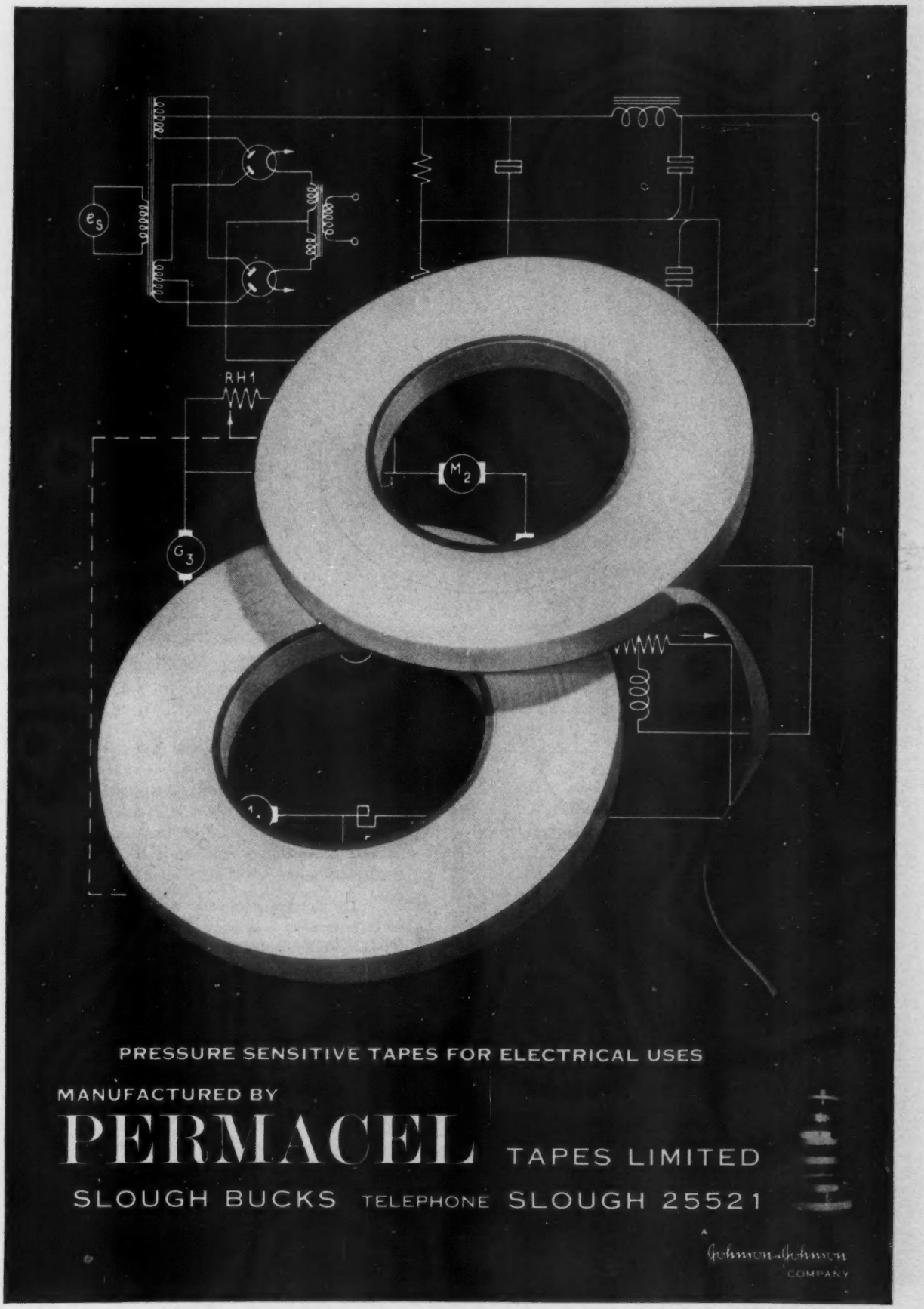

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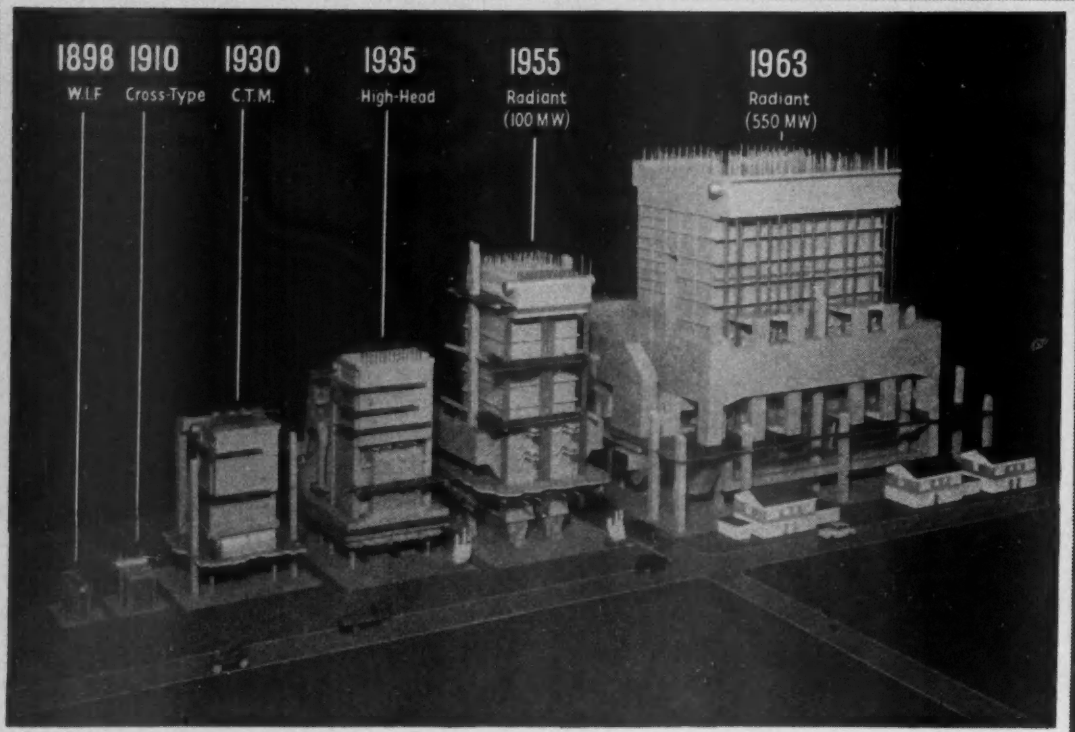

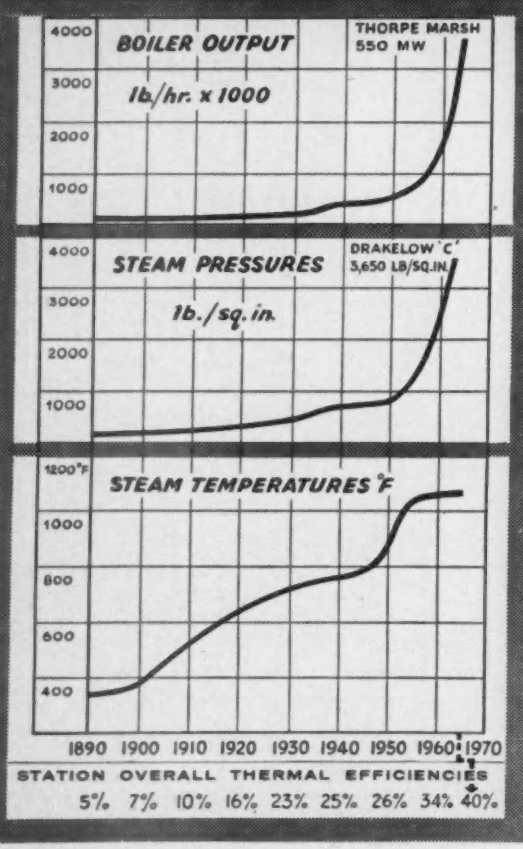

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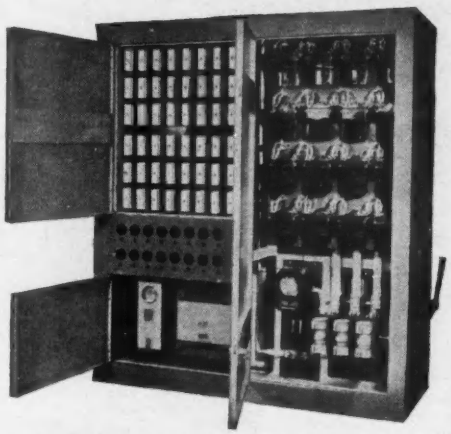

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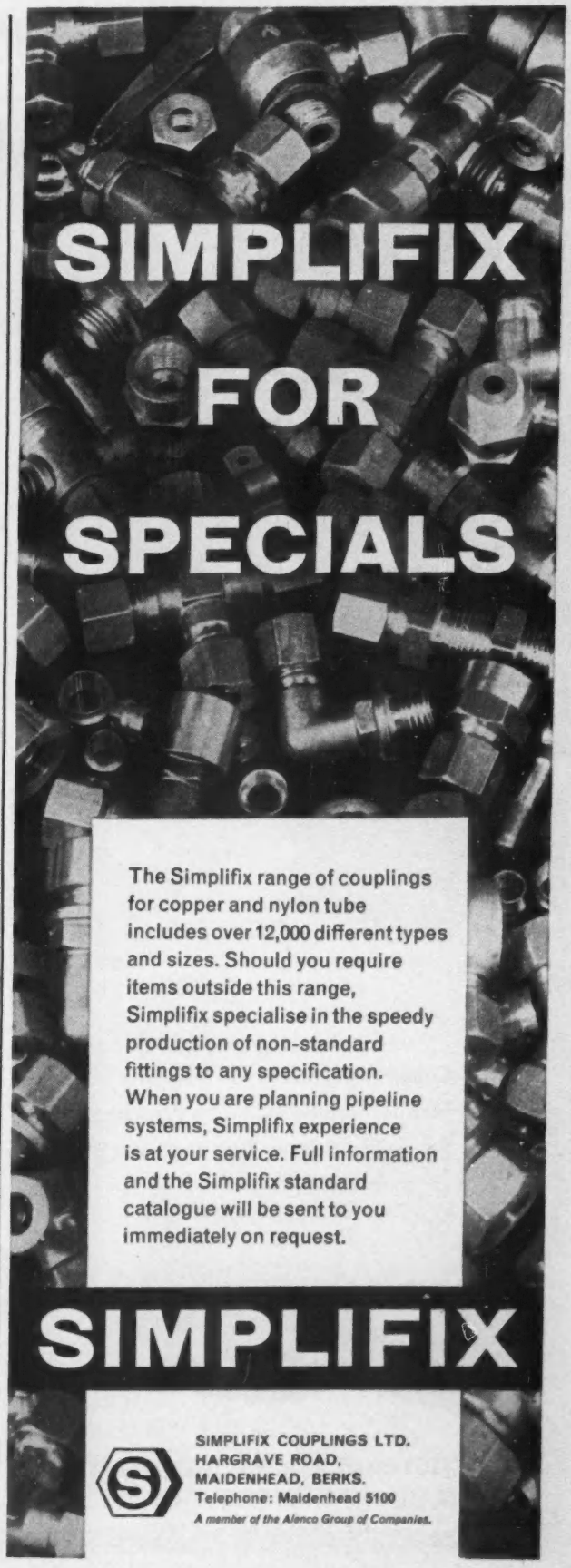
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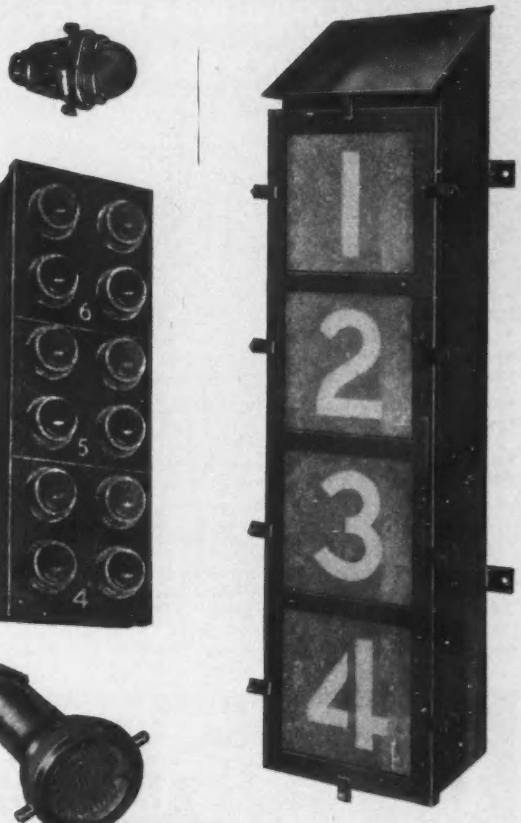

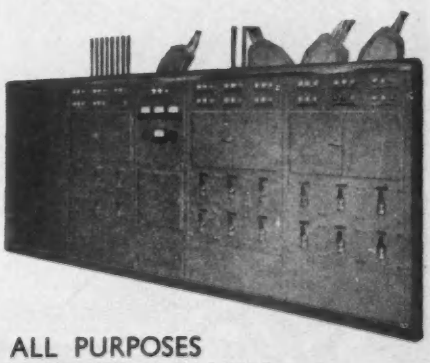

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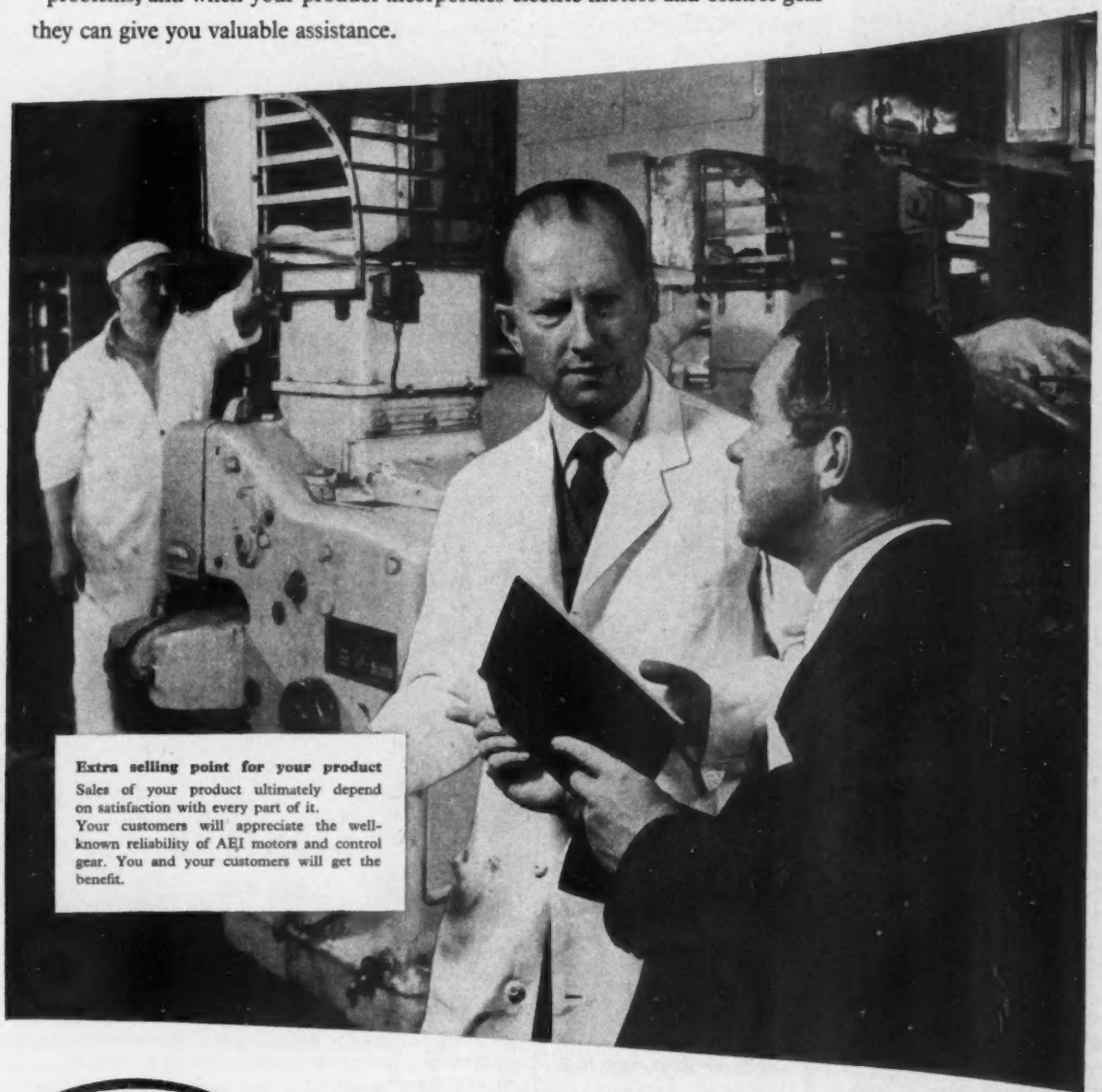

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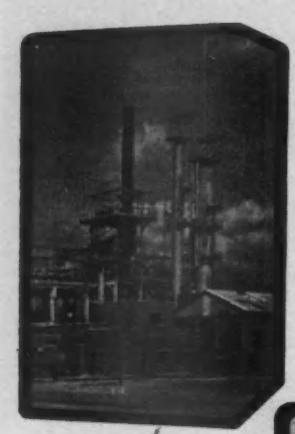

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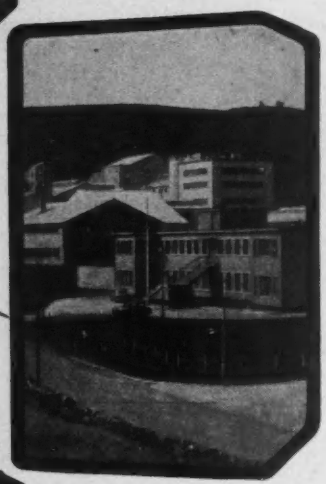

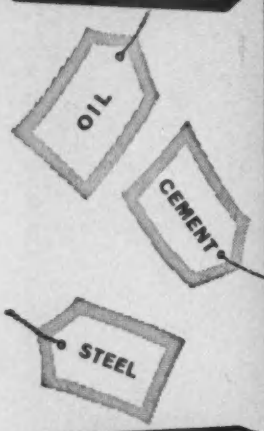

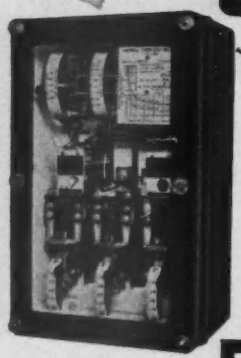

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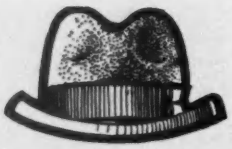

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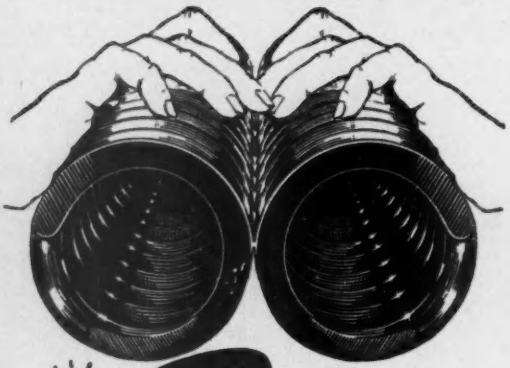

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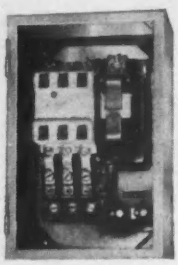

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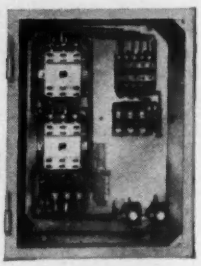

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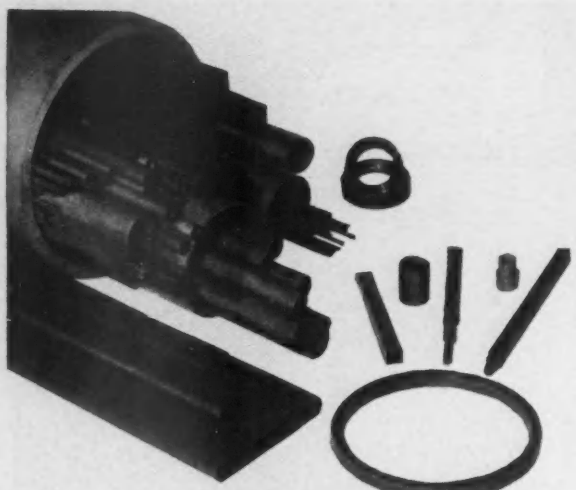

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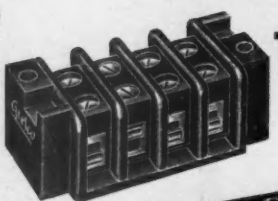

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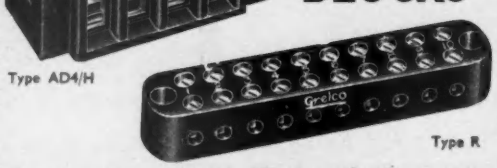

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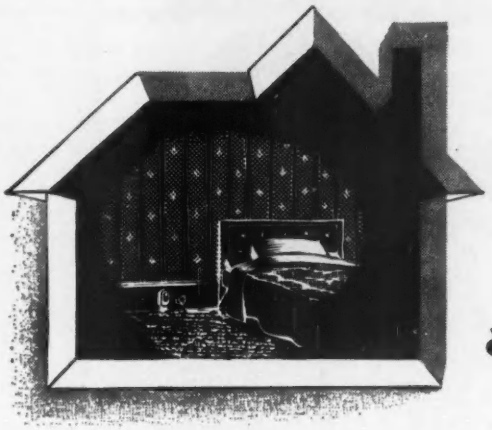
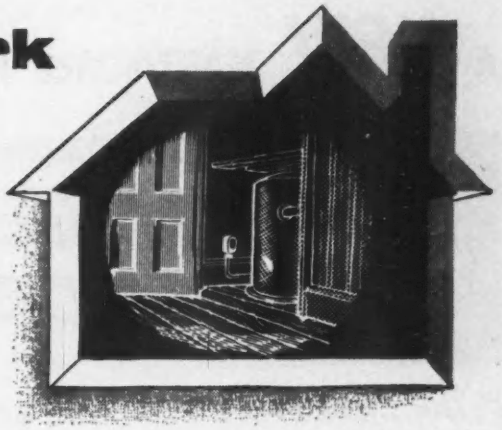
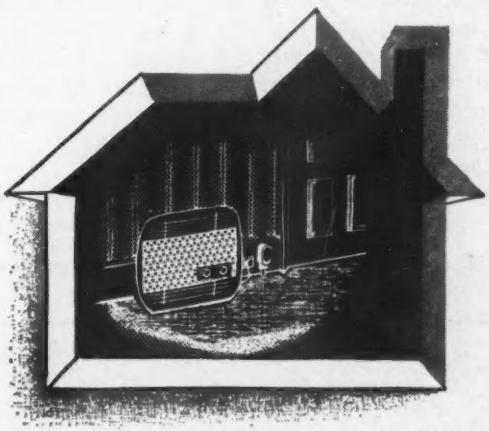
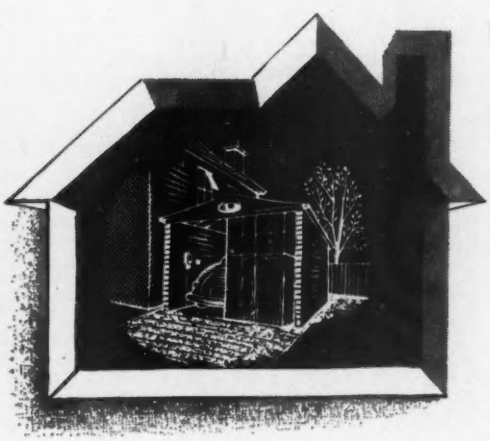
Put VENNER to work about the house



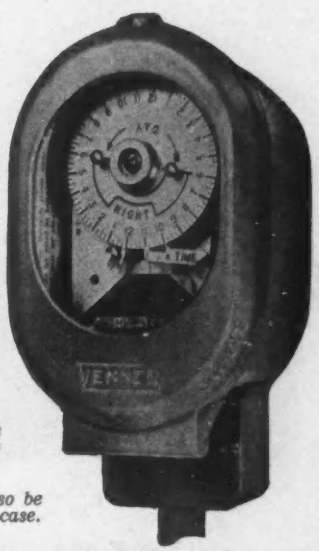




The average home today relies more and more on electrical equipment which can prove expensive if it is not properly controlled . . . immersion and under floor heating, for example. The Time Switch type MD1QP illustrated can switch an immersion heater off at night as well as on again in the morning while the family are still sleeping, saving power overnight but still providing hot water when it is needed. It can also control an electric blanket, porch or drive lighting, or a wireless set used as an early morning alarm.



Once set, the Time Switch needs no attention. The clock is electrically actuated; an external switch allows the appliance which it controls to be turned off when it is not needed. There are many variations of the Venner Time Switch, all described in our No. 1 series of leaflets, free on request.



A cable cover is available for conduit wiring. Rating 20 amps. 200/250v. A.C.

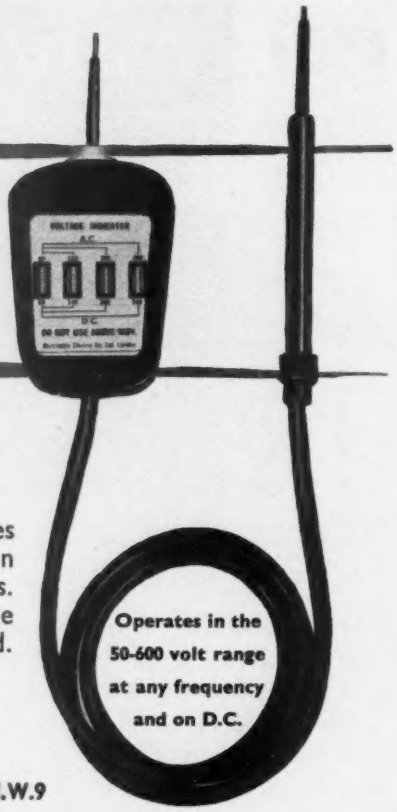
The Time Switch can also be supplied in an all-plastic case.

Venner Limited, Kingston By-Pass, New Malden, Surrey.
Telephone: MALden 2442

VENNER Time Switches

A *NEW* MARTINDALE INSTRUMENT!

THE VOLTAGE INDICATOR



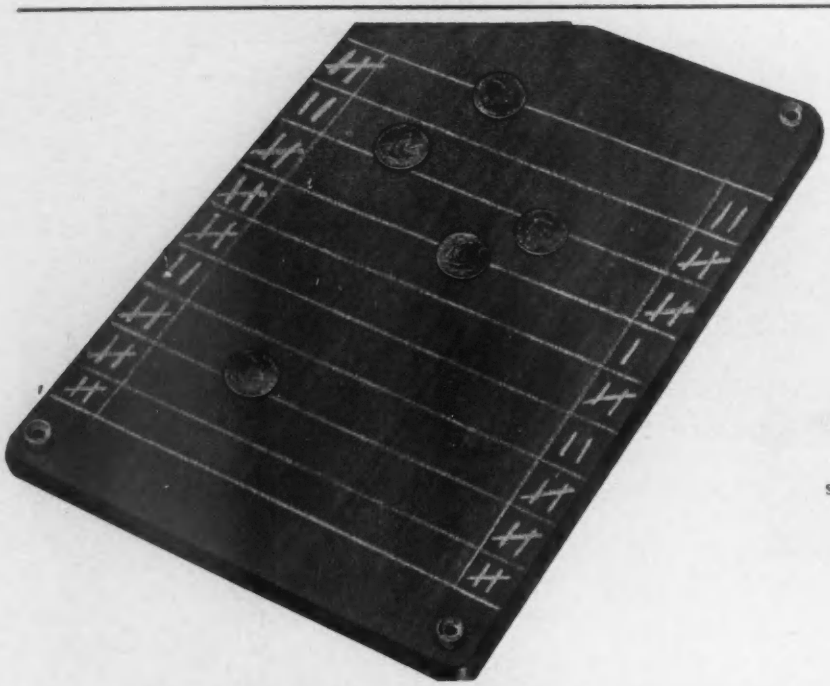
THE SUBSTITUTE FOR TEST LAMPS

TELLS YOU CONCLUSIVELY IF A CIRCUIT IS REALLY SAFE

The Voltage Indicator fits comfortably into the hand; only measures 3½" x 2½" x ¾"; almost unbreakable; has no moving parts. Indication is by four neon tubes which light progressively as the voltage rises. The use of a number of tubes is an additional safety factor as at the higher and more lethal voltages more than one lamp is illuminated. The instrument is fully fused and protected.
Can be used to ascertain polarity.

Write for illustrated leaflet to:

MARTINDALE ELECTRIC COMPANY LIMITED, 45 Westmorland Road, London, N.W.9
Tel. COLindale 8642



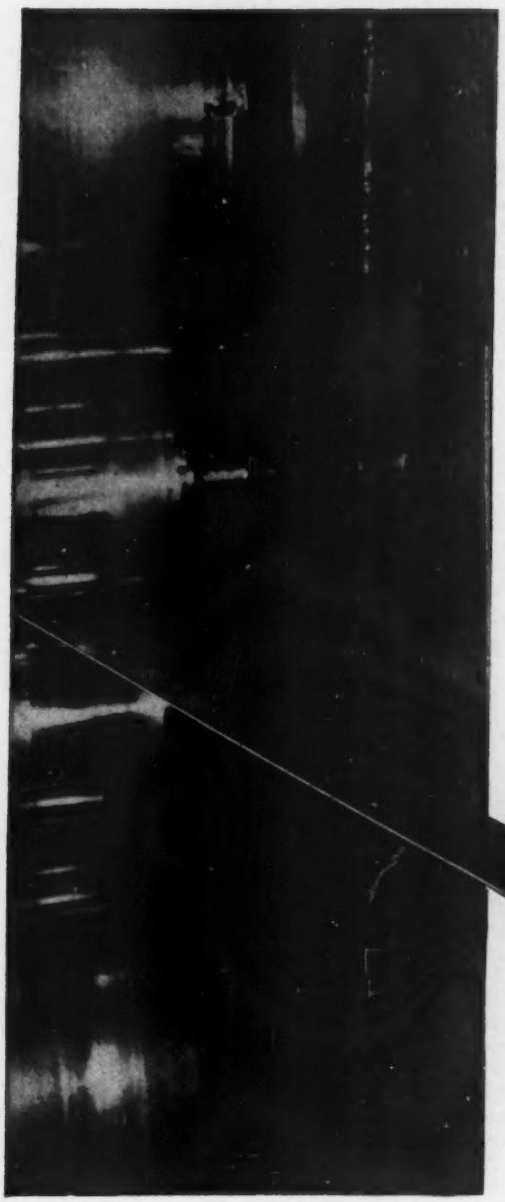
Wootton meter boards win every time!

Obviously, when they're Wootton-made, and Wootton-tested. Made from the best plywood Wootton could lay hands on. Tested for reliability . . . toughness . . . durability. Wootton meter boards stand up to anything. No contraction or expansion or warping with Wootton! Oh, and there's more to Wootton than just meter boards. They make wood blocks too, and instrument cases, and they're brilliant at sunk switch boxes.

WOOTTON–the meter board people

WOOTTON & CO. LTD
ALMA WORKS · PONDERS END · MIDDX
Telephone: HOWard 1858

copper strip



ROLLED STRIP

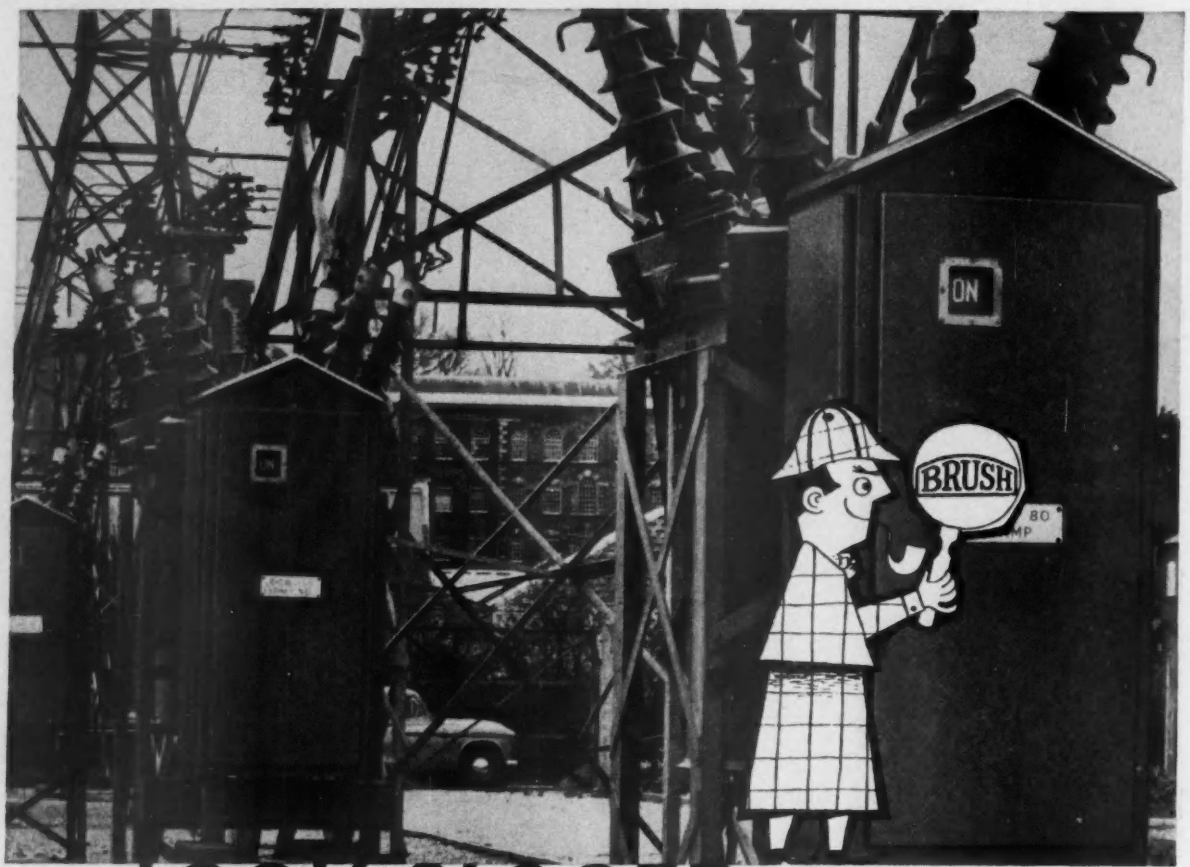
Cold rolled strip is available over a wide range of thicknesses and widths

Rolled strip can be supplied soft, half hard or hard

Thicknesses are from 0·002″ upwards and widths up to 5½″

Test gauging copper strip

FREDERICK SMITH & COMPANY ANACONDA WORKS · SALFORD 3 · LANCS



LOOK CLOSER...

...and you'll find the name on this Outdoor Circuit Breaker. That name is Brush and to those who are concerned with electrical installations it is synonymous with absolute dependability. Brush 33 kV Oil Circuit Breaker Units comply with requirements of British Electricity Boards' Specification BEBS-S4. 33 kV Breakers are short-circuit tested for 800 & 1200 ampere 500 MVA Rating, 750 MVA Rating, 1000 MVA Rating. Also Short-Circuit tested to the American Standard for Re-closing Service on Power Circuit-Breakers, (Specification C. 37.7. Re-closing Duty Cycle 111) for a rating of 500 MVA at 34.5. kV. Brush will design, supply, erect and commission a complete 33 kV sub-station from a simple line drawing enquiry.

BRUSH

BRUSH ELECTRICAL ENGINEERING CO. LTD · LOUGHBOROUGH · ENGLAND

A member of the Hawker Siddeley Group

NEWS SHEET

CEGB to pay £100,000 for nuclear station tenders whether accepted or not, to cover manufacturers' costs, where firms are invited and submit bona fide tenders. (107)

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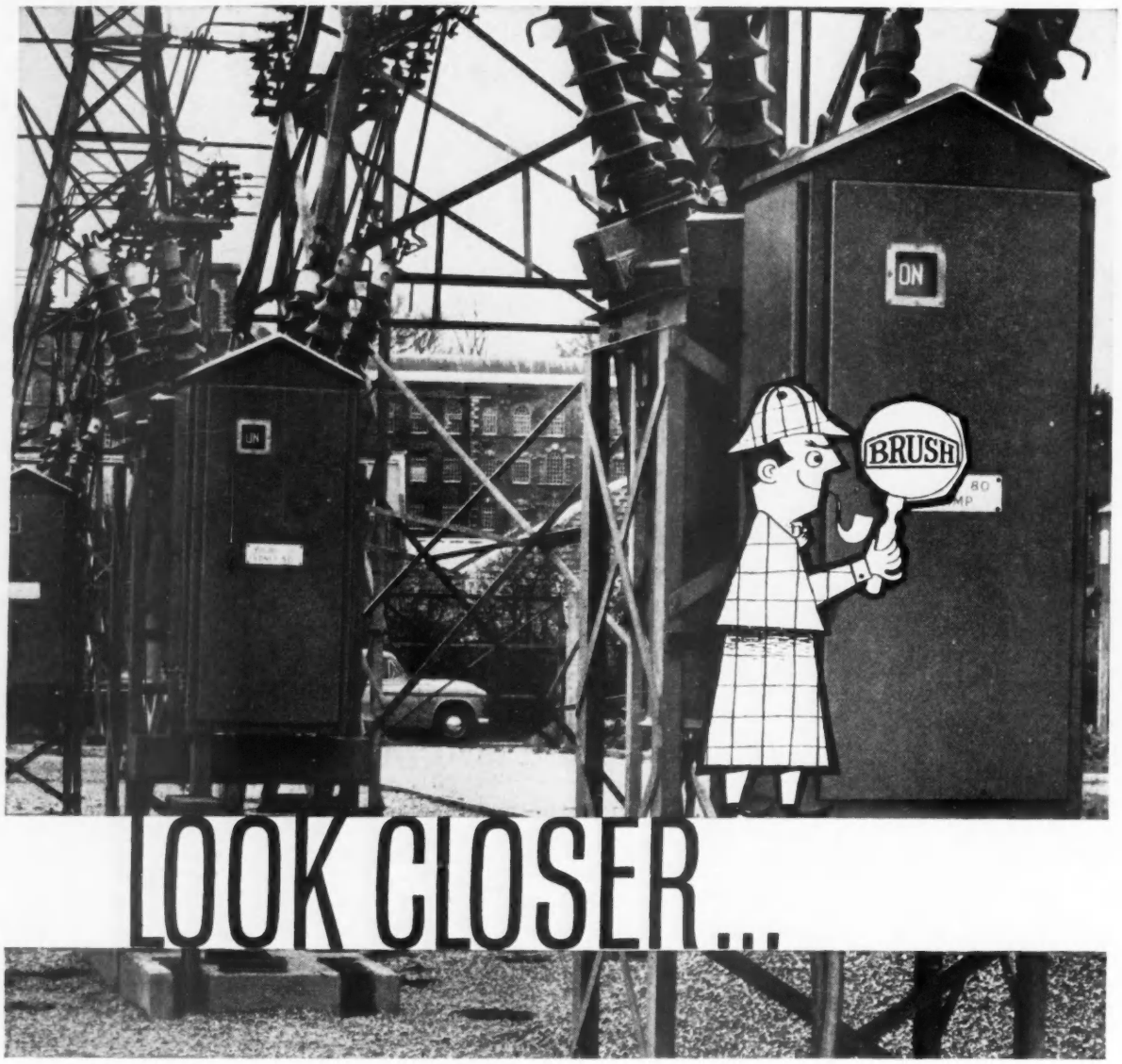

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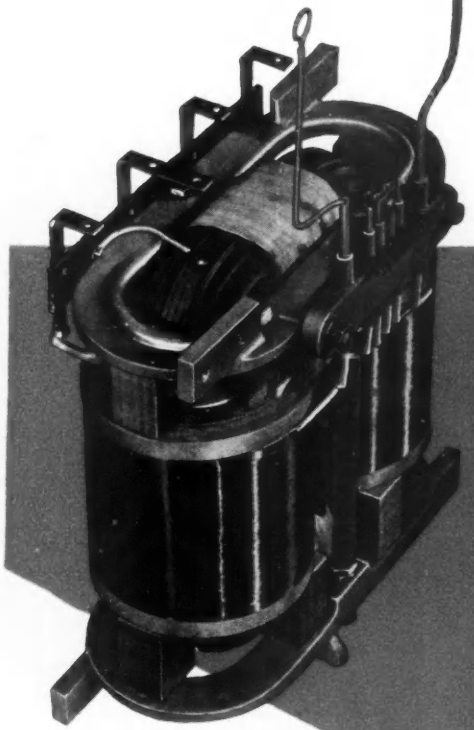
RURAL TRANSFORMERS

of advanced Electrical, Thermal and Mechanical Design



Continuous loop core—improved magnetic performance.
Reduced iron and copper losses.
Low hot-spot temperature gradient.
High resistance to line surges.
Great short-circuit strength.

Closed loop core of grain oriented steel.

Winding a high-voltage coil on a closed loop core.

RATINGS AND VOLTAGES

The transformers are manufactured in a range of five sizes, viz., 5, 10, 15, 25 and 50 kVA and are designed for operating on a single-phase, 50 cycle, 11 kV or 6·6 kV supply.

OVERLOAD CAPACITY

The transformers are capable of withstanding the following overloads for two hours, without injurious heating, following continuous full load with an average ambient temperature not exceeding 20°C.

5 kVA 100%
10 kVA 45%
15 kVA 25%
25 kVA 15%
50 kVA . . . . . As B.S. 171 and C.P. 1010.

IMPULSE LEVEL

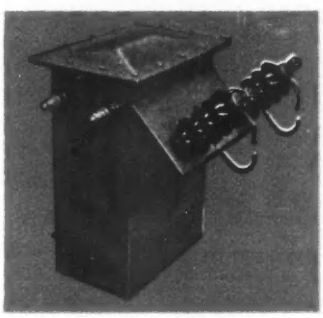
The H.V. windings are designed for the following impulse levels :—

6·6 kV . . . . . 75 kV full wave.
11 kV . . . . . 100 kV full wave.

PERFORMANCE

	5 kVA	10 kVA	15 kVA	25 kVA	50 kVA
Magnetising Volt-Amperes (approx.)	30	45	60	90	150
Iron loss at normal voltage (watts)	22	38	49	70	125
Copper loss at normal rating @ 75°C. (watts)	170	300	420	630	1070

Write for Leaflet No. 523.



15-kVA transformer showing double-gap arcing horns, and bolted-on domed and flanged cover.

BRUCE PEEBLES & CO LIMITED

EDINBURGH

C

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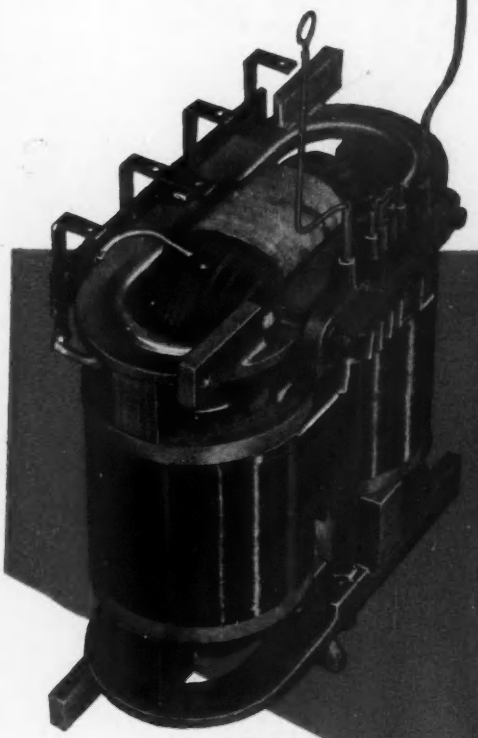

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Low hot-spot temperature gradient.
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15-kVA transformer showing double-gap arcing horns, and bolted-on domed and flanged cover.

BRUCE PEEBLES & CO LIMITED

EDINBURGH

C

HOOVER DIDN'T FORGET

*A-MP

When they designed the Hoover 'Keymatic' fully automated washing machine—the most marked advance to date in this field—Hoover, knowing full well the complexity of the electrical circuitry involved and that reputation depends on reliability, standardized on A-MP solderless terminals. The nine harnesses which make up the 'Keymatic' wiring circuits employ 132 FASTON* and other terminals especially designed to meet the particular requirements of Hoover engineers. Terminals are applied by A-MP automatic machines giving high output at minimum cost, ensuring complete reliability of operation.

A-MP
TRADE MARK
★ Trade Mark of
AMP Incorporated U.S.A

AIRCRAFT-MARINE PRODUCTS (GT. BRITAIN) LTD

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AP186

Glass-sealing Alloys by—

B·D·H

Nature, we know, abhors a vacuum. But a radio valve or cathode ray tube cannot work without one. Glass-sealing alloys are therefore in continual conflict with a basic natural law.

Our glass-sealing alloys are suitably armed. Specifications are the outcome of interminable research, and they are adhered to rigidly in production. Manufacturing techniques and controls have but one aim—utter reliability in the finished material. Works and laboratory testing teams sit in final judgement.

The result is a range of glass-sealing alloys whose various expansion characteristics accord with most of the commonly-used glasses and ceramics. Given a life-long, vacuum-tight seal as the ultimate end, then the extraordinarily painstaking means we use to achieve it, to so many people's satisfaction, are more than justified.

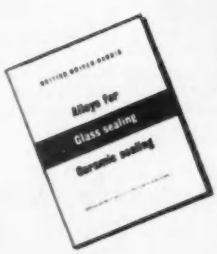
No. 4 Alloy. Used in the radio valve industry for contact pins in moulded glass bases, and also for the sealed-in buttons in cathode ray tubes. It can be used without copper coating with soft glasses of the lead silicate type.

48% Nickel-Iron. The coefficient of expansion of this alloy is approximately equal to that of soft glasses such as soda-lime and lead. It is therefore used over a very wide field; radio valves and mercury vacuum switches are examples. This alloy has the high susceptibility needed for low wattage relays or pick-ups, and its negligible core loss is useful in high-frequency transformers or relays.

Therlo* For hard glasses of the borosilicate-type, an alloy with low expansion properties is essential. Therlo* is designed accordingly. It is used for contact pins in radio valve glass bases, all hard glass applications and certain ceramics.

Special Compositions. We welcome being put on our metal—in every sense.

**Regd. Trade Mark*



Fuller technical information is given in Data Sheet No. 3, a copy of which will be sent to you on request.

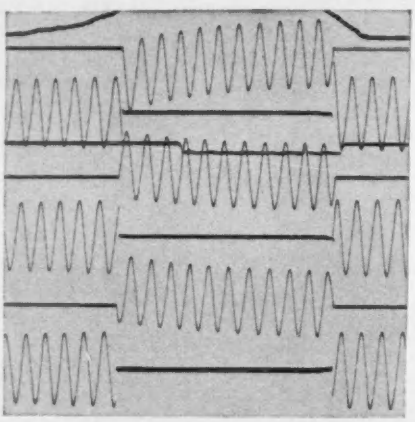
NICHROME
REGD. TRADE MARK

BRITISH DRIVER-HARRIS CO LTD

CHEADLE HEATH,
STOCKPORT, CHESHIRE

Testing plays a larger part in the development of switchgear than of most plant. And it is not a matter of subjecting a circuit-breaker to a heavy overload to see whether it blows up. On the contrary, to the non-specialist observer a test is an almost ludicrous anti-climax. The build-up is impressive; long preparation, elaborate fire precautions, the switchgear itself as distant as the target in a rifle range and watched through armoured glass. A warning hooter clears the site. Then the test engineer presses a control switch . . . in complete silence absolutely nothing happens, and the test—another 'shot'—is over. But a battery of oscillographs has recorded on photographic film a complete history of everything of importance that happened inside the switch. This is one approach to . . .

This thing called know-how



Any new design or improvement of an existing one involves many such tests of numerous detailed innovations. They are the means by which the designer checks his work as it proceeds. Ready access to test facilities is thus an essential of his work. We are fortunate in having at Chelmsford one of the most up-to-date (ASTA) testing stations in the country, and this has played a most important part in the evolution of all our switchgear. But there is another side to know-how which comes from sheer experience—and we have had 80 years of that.

Crompton Parkinson LIMITED

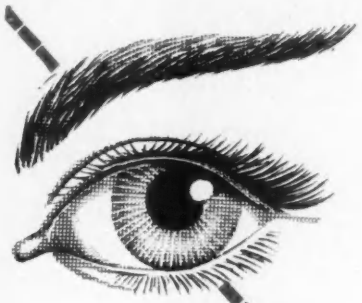
ELECTRICAL EQUIPMENT

OWNERS OF AN APPROVED ASTA TESTING STATION

Makers of Electric Motors of all kinds, A.C. and D.C. Generators, B.E.T. Transformers, Switchgear, Cables, Instruments, Lamps, Lighting Equipment, Batteries, Stud Welding Equipment, Traction Equipment, Ceiling Fans.

CROMPTON PARKINSON LTD., CROMPTON HOUSE, ALDWYCH, LONDON, W.C.2.

S611



The radiant type of hot-plate the house-wife likes to see!

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Europe's Leading Heating Element Specialists.

Backer

THE BACKER ELECTRIC COMPANY LIMITED

ROTHERHAM. YORKS. *Telephone; Rotherham 78181 (8 lines) Telex; 54161.*

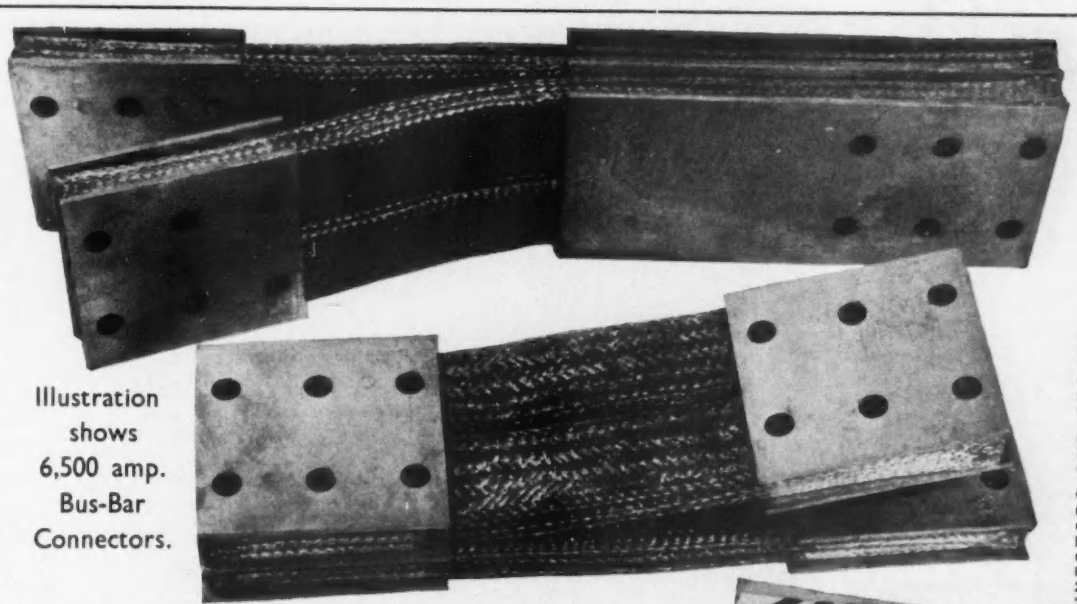

Illustration shows 6,500 amp. Bus-Bar Connectors.

SAXONIA ELECTRICAL WIRE Co. Ltd.

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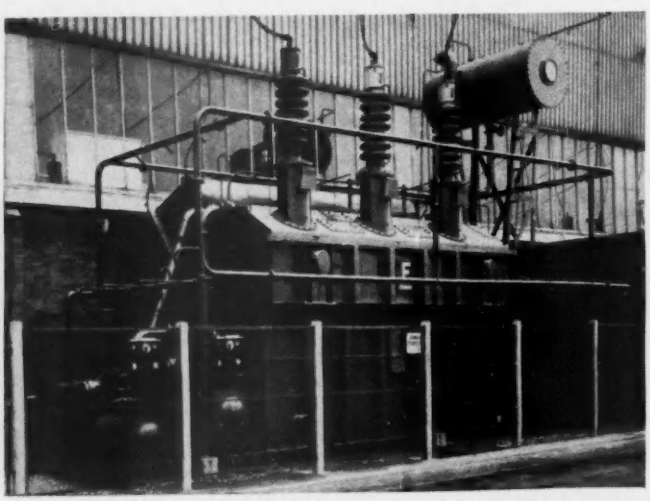
OFW type.



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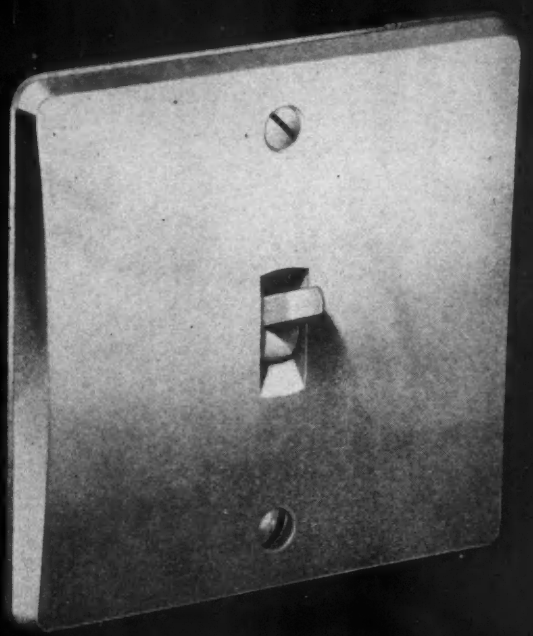
FT 269/2

the switch that is silent...



that's the New Approach of G.E.C.

'MUTAC CLIPPER'

G.E.C. Installation Equipment Group have a *new approach* to switch design which serves to take the clicking out of switching.

If you listen hard enough you *may* just hear the discreet whisper of a 'Mutac Clipper'.

Furthermore, the *new approach* makes 'Mutac Clipper' switches unrivalled for ease and speed of assembly . . . ensures that these precision-made, electronically-tested switches give a guaranteed long-life performance.

G.E.C.'s *new approach* enables you to put one, two or three 'Mutac Clipper' switches in a standard BS1299 box. There's a choice of 44 different switch plates—in moulded plastic or metal—and 11 interchangeable units fit into just three different sized boxes:

5 amp 1 way S.P.
15 amp 1 way S.P.
5 amp 1 way D.P.
5 amp 2 way S.P.
5 amp 2 way & off
5 amp intermediate
5 amp 1 way secret
5 amp 2 way secret
Bell Push
Neon Indicator
Blanking Unit

'Mutac Clipper' switches cost no more than ordinary switches to buy and far less to install—that's a result of G.E.C.'s *new approach.* Complete interchangeability of 'Mutac Clipper' enables you to standardise right through a job.

INSTALLATION EQUIPMENT GROUP

***IMMEDIATE DELIVERY** of all 'Mutac Clipper' switches from wholesalers throughout the country. If you would like more detailed information, ask your wholesaler for 'Mutac Clipper' literature.*

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POSITION.....

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from 1/25th. to 600 horsepower

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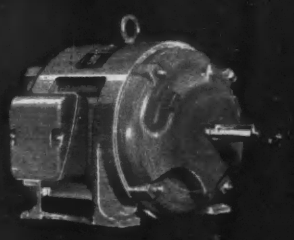
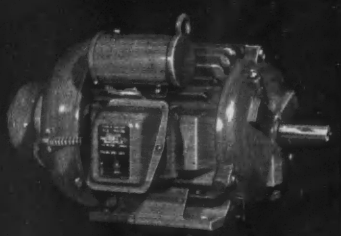
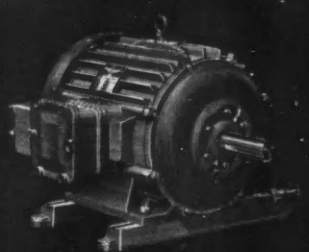


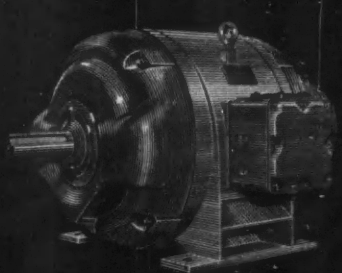
DRIP PROOF
'C' type motor to B.S.2960. For all normal driving applications.



SINGLE PHASE CAPACITOR
Available in T.E. Fan Cooled (as shown) or in Drip Proof enclosure. Both types have a robust, easily accessible centrifugal switch.



FLAMEPROOF
A compact design. British Standard F.L.P. certified for gases in Groups 1, 2 and 3. Interchangeable with T.E.F.C.



LARGE SLIP RING
Cage or slip ring types in larger Drip Proof frames are made up to 600 h.p.

T.E. Fan Cooled motors are offered up to 275 h.p.

A CALL TO ANY OF THE NUMBERS LISTED BELOW WILL BRING YOU IMMEDIATE SERVICE.

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Birmingham Mid. 0182/3—Bristol 27671/2—Glasgow Cen. 1045
Leeds 34303/4—Leicester 50781/3—Liverpool Ray. 4100 & 6261
Manchester Cen. 8305/7—Newcastle EI-4138/9—Norwich 25099-23444—Nottingham 55412, 3—Plymouth 62609—Sheffield 20477/8
Swansea 57559

U.S.A.
Chicago IIIdependence 3-6464.

CANADA
Toronto Cherry 9-3309. [illegible]

'HIDUTAC' switchfuses break 8 times their rated full load current

This high breaking capacity is made possible by cam-operated, silver contact, double-break "interruptor" units—just one of many 'Hidutac' exclusive features resulting from the *new approach* of the G.E.C. Installation Equipment Group to switchgear design. The *new approach* has crystallised from G.E.C.'s many years' experience of making switchgear superbly well.

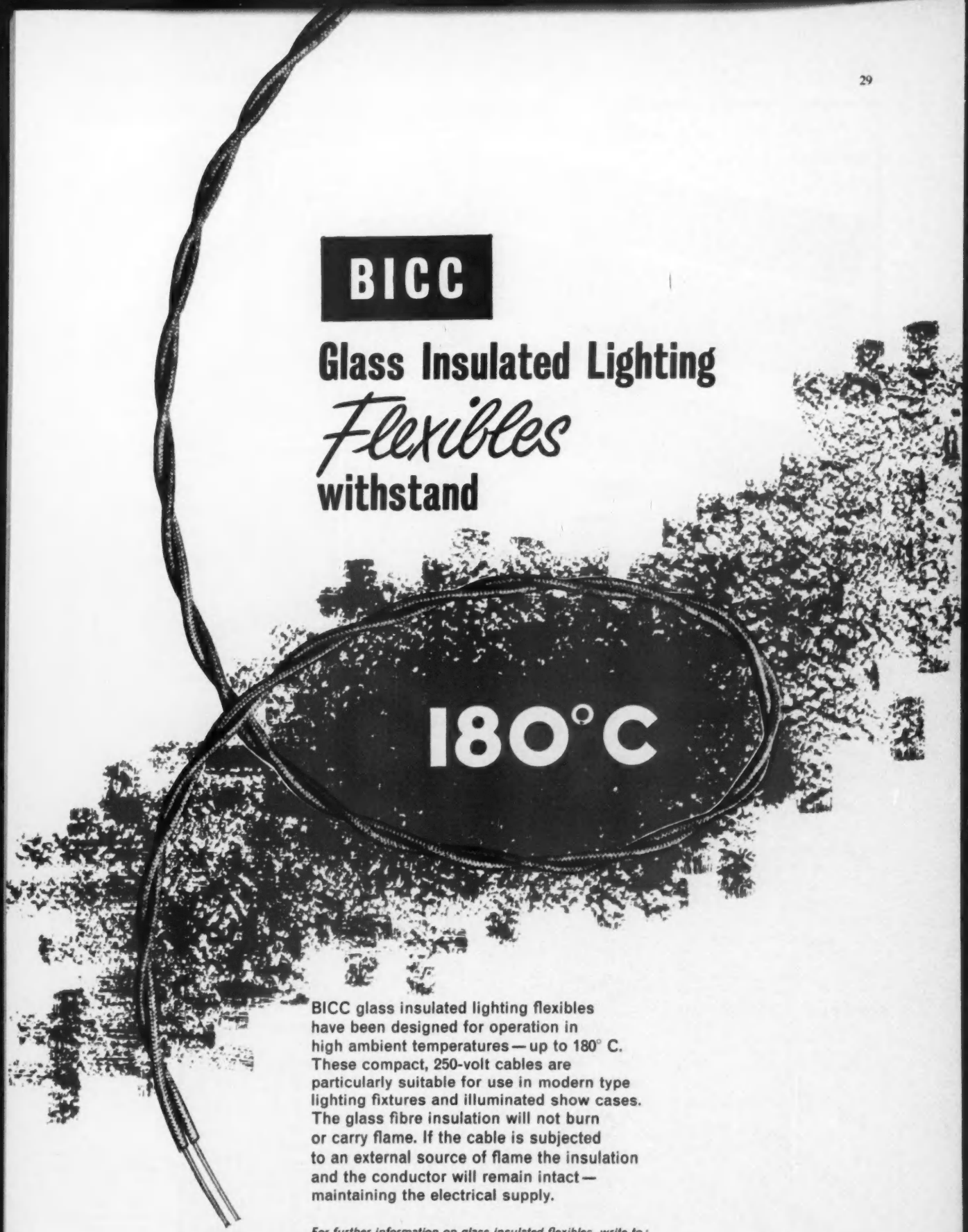
Consider these other impressive advantages: *Unlimited full load switching*—'Hidutac' switchfuses operate at their full load current with unfailing reliability. *A unique compactness*, brought about by radial positioning of contacts. Generous wiring space and easy access to terminals at the front. *Total internal enclosure* of all moving parts, with shields over live terminals. *High fault current protection* in Single Pole and Neutral, Double Pole, Triple Pole and Neutral switchfuses with H.R.C. or rewirable fuses. Categories of duty are: H.R.C. fuses, all ratings, AC4 of BS88 (33000 amp); rewirable fuses, 15 and 30 amp ratings, S2A of BS3036 (2000 amp); rewirable fuses, 60 amp rating, S4A of BS3036 (4000 amp). *Modern styling* of pressed steel case with fully interlocked cover.

These exclusive features make 'Hidutac' switchfuses vastly superior for tungsten and discharge lighting control, motor control, and transformer and capacitor switching.

IMMEDIATE DELIVERY of 'Hidutac' switchfuses from wholesalers throughout the country. For more detailed information ask your wholesaler for 'Hidutac' literature.

that's the New Approach of G.E.C.

INSTALLATION EQUIPMENT GROUP



BICC glass insulated lighting flexibles have been designed for operation in high ambient temperatures — up to 180° C. These compact, 250-volt cables are particularly suitable for use in modern type lighting fixtures and illuminated show cases. The glass fibre insulation will not burn or carry flame. If the cable is subjected to an external source of flame the insulation and the conductor will remain intact — maintaining the electrical supply.

For further information on glass insulated flexibles, write to:

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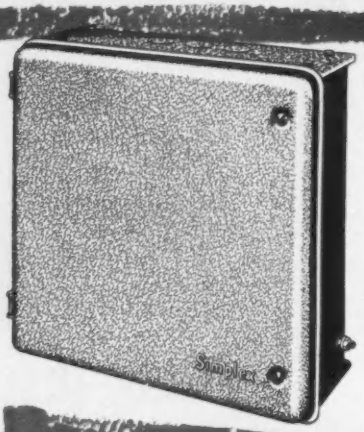
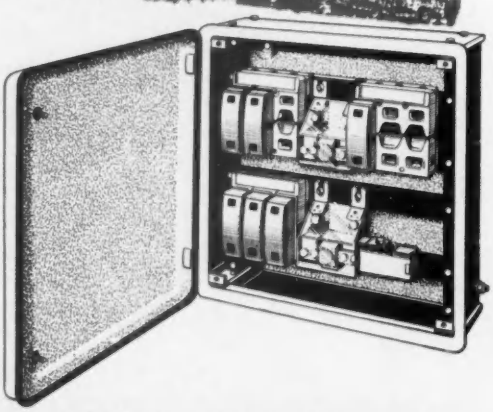
21 BLOOMSBURY STREET, LONDON W.C.1

Simplex Star Switchgear



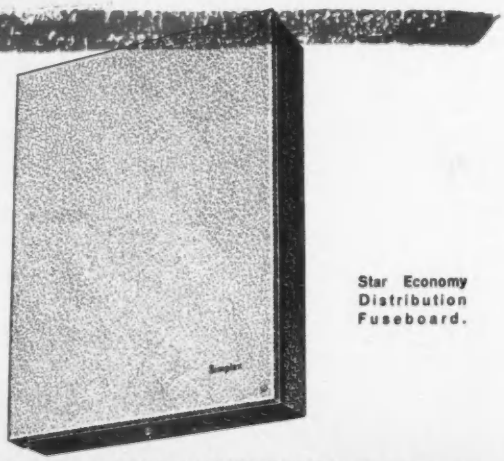
Star Distribution Fuseboard. Neat appearance. Strong All-Steel case.



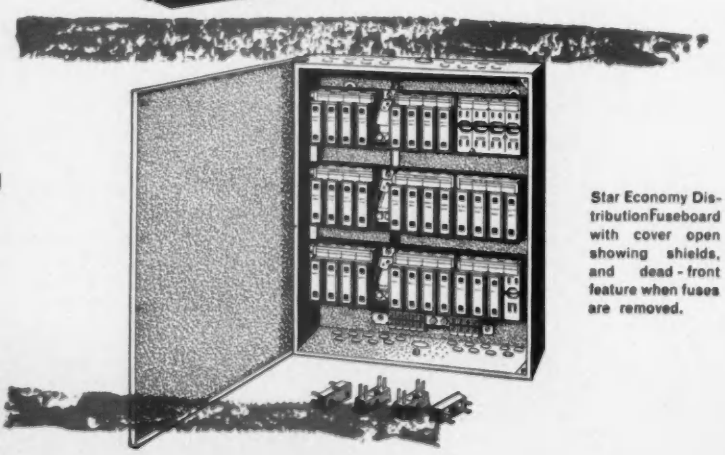
Star Distribution Fuseboard with cover open; some fuses are removed to show dead-front feature.

DISTRIBUTION FUSEBOARDS

Simplex Star "dead-front" Distribution Fuseboards are: low in price · easy to wire · completely safe because all live parts are shrouded, even with the fuses removed. There is provision for: circuit identification on the fuse bank and neutral connections · surface or flush mountings, Ratings — 15, 30 or 60 amp, 500 volt A.C. or 250 volt D.C. Star Economy Distribution Fuseboards offer the same advantages as the Star Distribution Boards at the lowest possible price. More details of Simplex Star Distribution Fuseboards available on request.



Star Economy Distribution Fuseboard.



Star Economy DistributionFuseboard with cover open showing shields, and dead-front feature when fuses are removed.

SIMPLEX ELECTRIC COMPANY LTD.
CREDA WORKS, BLYTHE BRIDGE
STOKE-ON-TRENT, STAFFS
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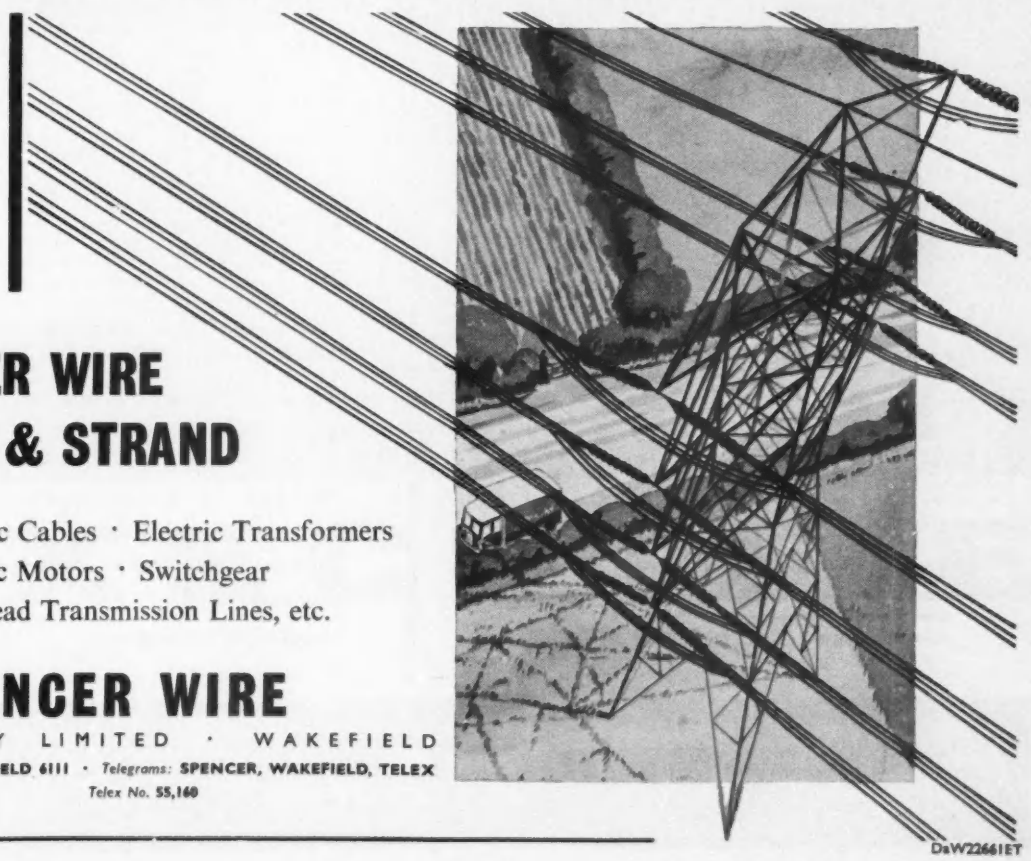

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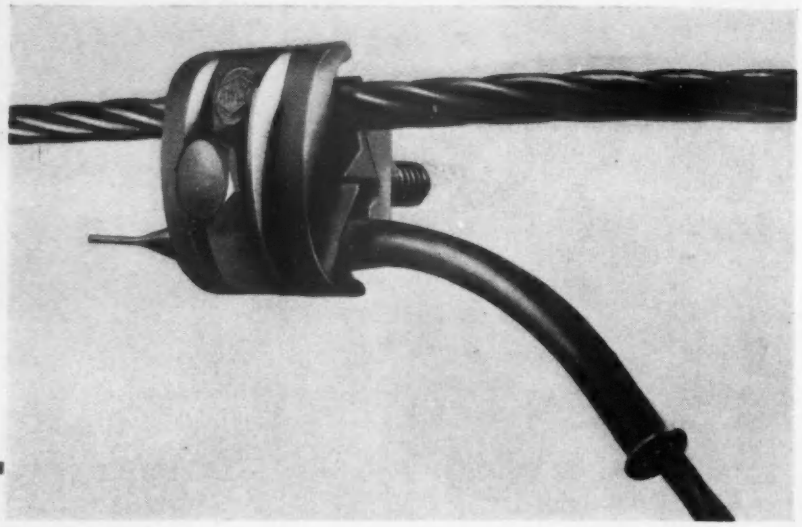
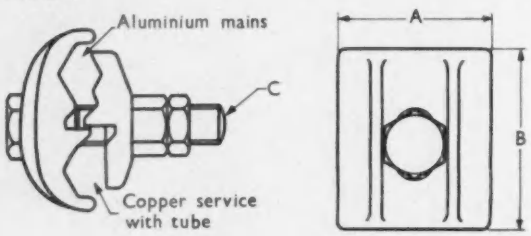
Introducing a lower cost line tap of improved performance and better appearance, for connecting copper conductors to ALUMINIUM overhead lines. Write to your nearest AWCO office or Agent for Data Sheet 9.12 and prices.



UNIVERSAL BI-METAL LINE-TAP

For ACSR, All-Aluminium and Silmalec Conductors up to 0·558 in. diameter.

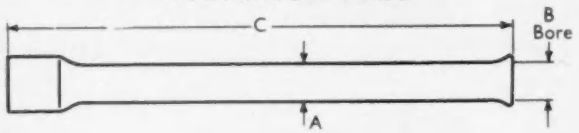
CLAMP



Catalogue number	Aluminium conductor diameter range	Dimensions				Approx. weight
		A	B	C		
				Dia.	Length	
	in.	in.	in.	in.	in.	oz.
ALCU-10	0.240-0.366	1.50	1.781	0.375	1.875	3.67
ALCU-20	0.367-0.558	1.50	1.781	0.375	1.875	3.68

NOTES.—When ordering, the catalogue number of the tap and the size reference letter of the tube must be specified.
All three sizes of tube can be used with the ALCU-10 and ALCU-20.

ALUMINIUM TUBE



Size	Copper conductor diameter range	Dimensions			Approx. weight
		A	B	C	
	in.	in.	in.	in.	oz.
A	0.092-0.182	0.250	0.202	6	0.25
B	0.183-0.244	0.313	0.265	6	0.38
C	0.245-0.300	0.375	0.327	6	0.46

AWCO offer all types of ALUMINIUM CONDUCTORS for overhead electrification including all-aluminium, ACSR and Silmalec* conductors—both bare and plastic-covered. Write to us for publications describing these conductors and their accompanying accessories for line erection and maintenance.

* Registered trade mark.

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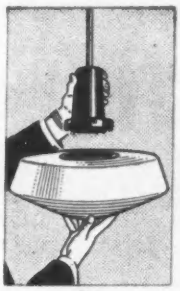
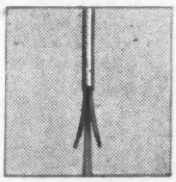
A new range of commercial lighting fittings, pendant and ceiling type, offering a wide choice of glasses, reflectors, skirts and suspensions, based on a quite small number of standard components. This is **EXECUTIVE** lighting, elegant, versatile and easy to maintain. Particularly suitable for offices, shops and stores, schools and public buildings.



New simple 'TURN and LOWER' action for easiest ever installation and maintenance.

G.E.C's new positive bayonet fixing with 'turn and lower' action means EXECUTIVE glasses can be fixed or removed in an instant, saving time and money on maintenance and lamp replacement. (Patent applied for).



EXECUTIVE suspensions in ten different lengths are either ½ in. silver anodised aluminium tube or this new steel reinforced white flexible with positive and independent anchoring system top and bottom. (Patent applied for).

Internal locking screw on lampholder prevents unscrewing when relamping.

EXECUTIVE

G.E.C.

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THE GEO RANGE OF ELLISON SWITCHGEAR

CURRENT RATING	AMPS	400	600	800	1200	1600
BREAKING CAPACITY 600 VOLTS	MVA	37.5	45	45	45	45
	kA	36	43.3	43.3	43.3	43.3
BREAKING CAPACITY AT 400 VOLTS	MVA	25	30	30	30	30
MINIMUM COIL SIZE TO GIVE STATED MVA	AMPS	200	400	600	600	1140
OVERALL WIDTH OF CIRCUIT BREAKER	INCHES	20	24 1/4	25 7/8	28 3/8	34 3/4

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CIRCUIT BREAKERS
ASTA CERTIFIED TO B.S.116:1952

Horizontally isolated, drawout type for service voltages of up to 660

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ELECTRICAL TIMES

SARDINIA HOUSE, SARDINIA STREET, LONDON, W.C.2
Telegrams: Equivolt . Estrand Telephone: HOLborn 6016

Dans ce numéro

Garniture des conducteurs en aluminium 109
L'introduction, il y a quatre ans, de soudures sans cadmium a permis de simplifier la préparation des extrémités des conducteurs en aluminium, avant qu'elles soient garnies au moyen de soudure conventionnelle. A part les méthodes de soudure se fondant sur les techniques dites " d'arrosage ", il existe des techniques satisfaisantes et encore plus simples à base de soudures " sans flux " ou abrasives que l'on applique avec une lampe à souder à gaz. La soudure au chalumeau est une des autres méthodes employées.

Utilisation de la poussière de charbon 113
La poussière de charbon interceptée dans les gaz provenant des chaudières de 130 tonnes/heure, qui sont chauffées par grilles à chaîne sans fin et qui se trouvent dans une centrale de 120 MW, contient 60% de combustible. On produit actuellement des briquettes à base de cette poussière à laquelle on ajoute du charbon de qualité inférieure et du goudron; ces briquettes sont ensuite brûlées dans les chaudières. Le coût de ce procédé est inférieur à la moitié du prix d'achat d'un charbon qui libèrerait une quantité équivalente de chaleur. Afin d'aider à la combustion de ces briquettes de qualité inférieure utilisées dans la centrale, les gaz chauds se trouvant au-dessus des foyers sont recirculés à travers les grilles.

Laboratoires A.E.I. à Rugby 115
Dans les nouveaux laboratoires du groupe A.E.I. (Rugby), les travaux se poursuivent sur des sujets tels que la production thermo-électrique, la physique de base des phénomènes relatifs aux décharges de lampes, la fabrication de transistors du type mésa, et la radiochimie. Parmi les applications pratiques qui se trouvent déjà ou presque au stade de la fabrication, citons une nouvelle source de lumière fluorescente d'une forme nouvelle et compacte, une méthode servant à enduire les conducteurs métalliques d'un matériau isolant au moyen d'un " bain fluidifié ", ainsi que des systèmes transistorisés de protection à distance pour les lignes de transmission d'alimentation.

In dieser Nummer

Das Verbinden von Aluminiumleitern 109
Die Vorbereitung der Enden von Aluminiumleitern zur Herstellung von Lötverbindungen mittels herkömmlicher Methoden wurde vor etwa vier Jahren durch die Einführung kadmiumloser Lötmittel erleichtert. Ganz abgesehen von jenen Lötmethoden, bei denen das Lötmittel über die Lötstelle zu giessen ist, gibt es zufriedenstellende und sogar noch einfachere Arbeitsweisen, bei denen zusatzlose oder Aufrauhungslötmittel in Verbindung mit einer Gas flamme Verwendung finden. Unter anderem wird auch die Flammenschweissung angewendet.

Die Verwertung der Feststoffe in Dampfkesselabgasen 113
Festoffe, die aus den in wanderrostbeschickten, 130 Tonnen/h verbrauchenden Dampfkesseln eines 120 MW Kraftwerks entstehenden Abgasen aufgefangen wurden, enthielten 60% brennbare Stoffe. Dieses Material wurde unter Zugabe von minderwertiger Kohl und Teer in Briketts umgewandelt und in den Kesseln verbrannt. Das Verfahren erwies sich um mehr als die Hälfte billiger als der Ankauf der zur Erzeilung einer gleichwertigen Wärmeleistung erforderlichen Kohlenmenge. Um die Verbrennung des im Kraftwerk einzusetzenden, minderwertigen Brennstoffes zu fördern, wurden die aus der Gegend oberhalb der Feuerung kommenden heissen Gase durch den Rost hindurch in Umlauf versetzt.

Die A.E.I.—Labors in Rugby 115
In den neuen Laboratorien der A.E.I. (Rugby) befassen sich Arbeitsgruppen mit Aufgaben wie thermoelektrische Krafterzeugung, physikalische Theorie von Lampenentladungsphänomenen, Herstellung von Mess-Transistoren und Radiochemie. Die praktischen Ergebnisse, auf Grund deren für gewisse Produkte das Fertigungsstadium schon ganz oder nahezu erreicht wurde, umfassen eine neue Art von gedrängter Leuchtstofflichtquelle, eine Methode, nach der metallische Leiter in einem Wirbelbett mit Isoliermaterial überzogen werden können, sowie transistor bestückte Fernschutzsysteme für Kraftübertragungsleitungen.

Jointing of Aluminium Conductors 109
by L. Roullier, A.M.I.E.E.

New Clip-on Service Connection for Solidal 112

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Power Costs for Farms 118

Inverse-time Relays 123
by J. L. Dineley, M.SC.(TECH.), A.M.I.E.E.

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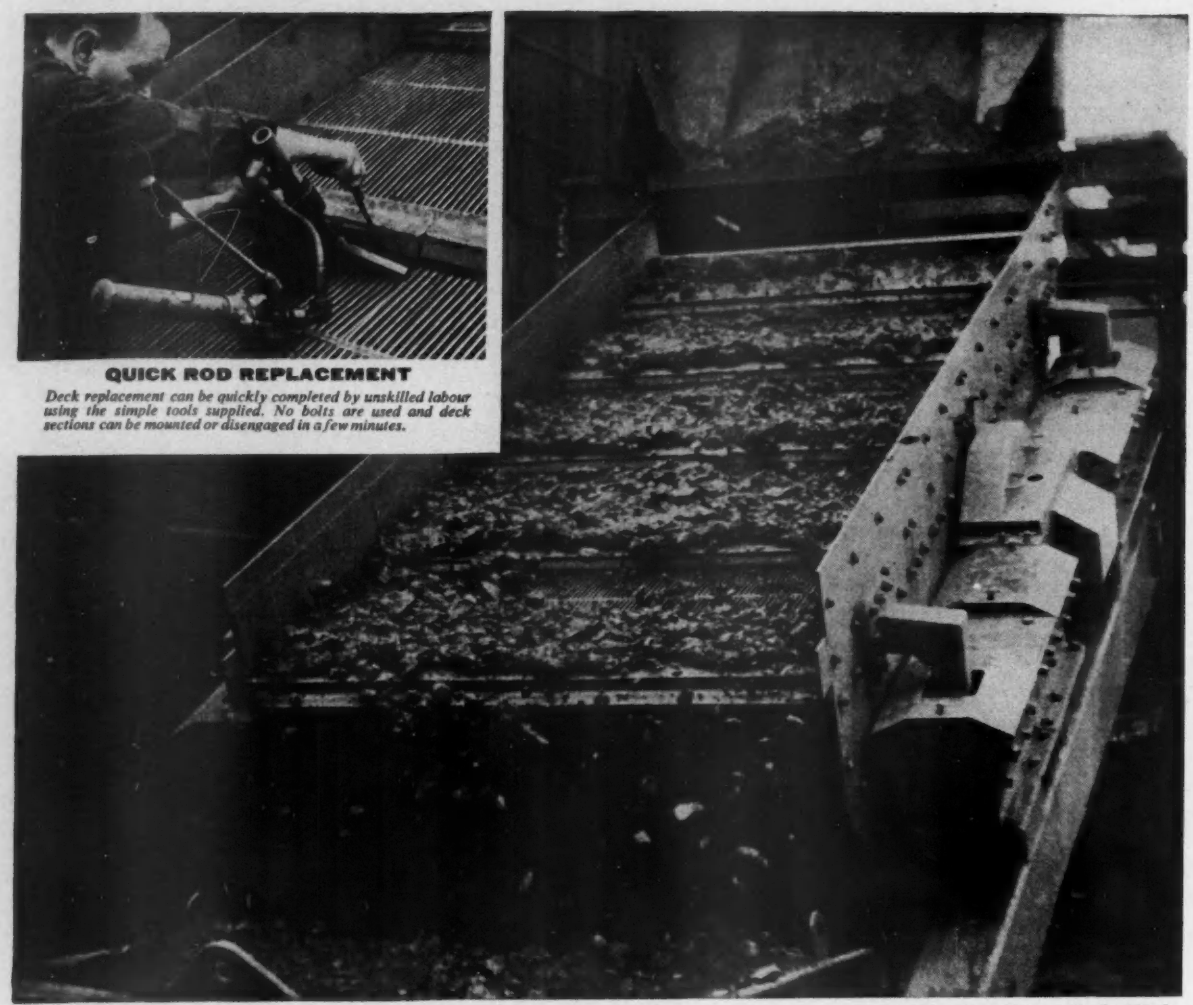

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ELECTRICAL TIMES

ESTABLISHED 1891

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Comment

PICTURE OF APPLIANCE PROGRESS

Once again a useful service has been offered the electrical industry by Odhams Press in making a detailed survey of the appliance market. This survey is the more valuable since it is the third completed in five years, thus comparable figures obtained with similar survey samples are now presented, from which trends may be deduced. It has been produced in connection with the paper, *Woman,* and details of the results are given on a later page in this issue. One trend that is noticeable with most appliances is the fall in sales of "other brands," suggesting that the public is tending to choose from the leading makes. This is a development to be expected and one likely to continue as the industry gears up to increasing mass production, a necessary step if overseas competition is to be met. Among the smaller appliances approximately 50% or more of the market is held by the leading brand in each case, while in others, particularly refrigerators, a more diffuse pattern of sales exists. The analysis shows clearly that the industry's best customers are families in the first five years of married life, particularly if there are children. Valuable as the survey will prove to be, it would have been of greater value to the industry if a breakdown of the acquisitions of appliances into replacements and new purchases could have been given. The information appears to have been obtained on the survey forms, and now that the replacement market is becoming a vital factor with several types of appliances this information would have been a useful addition.

PAYMENT FOR TENDERS

Tendering for any engineering project is expensive, but when the scheme is a nuclear power station, the cost of tender becomes a significant item in a company's costs. Chairmen of manufacturers active in the nuclear field have expressed themselves strongly on this point in the past. A year ago, Lord Chandos in his BEPC presidential address complained that it was costing £200,000 to tender for a station. Now the CEGB have decided that, subject to certain safeguards, they should offset some of this cost for manufacturers. In future, any firm invited to tender for a specific nuclear power station will be paid £100,000 for a bona fide tender, whether they win the contract or not. The payment is a recognition of some of the civil design work that in conventional stations would be carried out by the CEGB before inviting tenders. The £100,000 will no doubt be commercially welcomed by the three active consortia. But it remains a probability that three teams of engineers will be engaged on tackling the same problem,

and two of them will largely waste their efforts. Even though some proportion of the cost will be paid by the prospective customer, tendering for nuclear stations will remain an exceptionally expensive business. The use it makes of the limited national asset of technical manpower involved has to be judged in the nature of an insurance policy against the CEGB receiving a less-than-best design or price. It may be that to ask for three tenders for each nuclear station will be reckoned to involve too high a premium. Whether it will be practicable to reduce to two tenders is in part a political question. It is surely one worth careful thought.

ELECTRICITY ON THE FARM

So loudly does the farming community demand electricity that it is not surprising to find that no one seems to have conducted full-scale experiments to determine the cash worth of electrification to the farmer. Now the South Western EB has put this right. An experiment with four farms has involved the economics of the farming operations before and after mains electricity became available. Broadly speaking, the result of this work is that electrification is shown to pay for itself so far as direct costs are concerned, but to offer no more than a marginal profit on this basis. This is because the capital charges on the equipment that has to be purchased to use electricity, balances the cheaper fuel costs compared with other methods. Yet independent observers of the SWEB tests have proclaimed that, in fact, electrification is well worth while. The answer lies in the indirect savings, particularly the reduction in labour. Since the moderate-sized farms which were the subject of the SWEB experiment employ only a few people, electrification did not save one man's full-time labour, and so save his wages. What it did was to make the work more agreeable—an important element in retaining staff in the country—and give more time for other productive work. This is a result that is wholly satisfactory, although one not so easily saleable from a promotional aspect as direct cash saving. But the demand for electricity is strong in any case. That two of the farms in the experiment were using expensive private generation to secure some of the benefits of electricity is in many ways a more convincing argument for its value than all the cost statistics that the experiment has given rise to, important though they are. To the farmer, it is clear, electricity is a much-valued amenity.

GENERATION INGENUITY

The story of some of the by-ways of generation development at Kingston Power Station is reported later in this issue. Ingenuity in station operation has been successful in keeping down the works cost in this 1949-commissioned station to below 0·7d kWh. Designed for the burning of up to 25% of coke with fair quality coal, the proportion has been worked up to 65%. Further, the remaining coal has been largely replaced by low-grade washery fines and slurry. One result of the combustion of cheaper fuel has been emergence of a serious and costly grit disposal problem. This, in turn, has been tackled successfully by briquetting the grit and refiring it. Not only is the 60% combustible material content saved from waste: as a bonus, worthless grit is replaced by clinker, which has a worth-while commercial value. The outcome is that costs at Kingston have been kept down to the level where the station, with its 30 MW sets and 285 klb/hr boilers, operates at above the national load factor, running for more hours per year than other stations of similar design and age. That is a proper source of pride for the people responsible. It is also a result typical of the striving for lower costs through application of technical inventiveness that is quite general in the industry. The results are naturally not always so spectacular as at Kingston, and often go unsung. But they reflect in national efficiency and cost averages, and keep down the overall cost of electricity to the consumer.

E.L.C.B. ALTERNATIVES

There is a growing rebellion of water supply authorities against their pipes being used as earth electrodes for electrical installations. Whether this be realistic or no, it has directed increased attention to alternatives to direct earthing in providing safety for installations. In most circumstances, the earth-leakage circuit-breaker provides the immediate answer—and a good one from the shock aspect so long as the breaker receives reasonable treatment. Yet the National Inspection Council has, in recent months, shown statistical backing for what some engineers have for long argued. Too often e.l.c.b's are not tested regularly and are allowed to become inoperative: and often they are not installed with enough attention to avoiding connections to earth in parallel with the voltage-sensitive earth trip. In the latter case, the installation remains safe from the shock risk aspect, but fire and other dangers associated with sustained leakage are unguarded against. The NICEIC answer is to stress the advantages of the differential-current e.l.c.b. If sufficiently high sensitivity can be obtained at reasonable cost, there may be something to be said for this. The design problem has, in the past, proved an intractable one, but it is being tackled again with some hope of success. The belt-and-braces approach of leakage protection through modest current balance sensitivity combined with a voltage-sensitive trip would be unduly costly. What is to be done in the light of the NIC statistics, then? Protective multiple earthing of the neutral provides an answer that deserves continued consideration. There are certainly risks with that technique, but the case for it is strengthened the more often unsatisfactory earthing conditions are found with other techniques.

Meteor

This week's quick summary of electrical news faces advertisement page 16

Jointing of aluminium conductors

MODERN PRACTICES DESCRIBED

by L. Roullier,* A.M.I.E.E.

IN the article entitled "Copper and aluminium in electric cables," by C. C. Barnes,† a brief description was given of the preparation required prior to making a soft-solder joint in a stranded aluminium conductor. This included a reference to cutting back and fanning out the wires to ensure good solder penetration, a procedure which has now been superseded as the result of the introduction, nearly four years ago, of "cadmium-free" solders which, used with available efficient organic fluxes, have considerably simplified the jointing of aluminium. Soft-solder joints in aluminium conductors can now be made with very nearly the same ease as those in copper conductors. Despite the extended usage nowadays of aluminium conductors in insulated cables, there is still ignorance of the preferred solder jointing techniques. It is hoped that the following jointing instructions will help to satisfy the apparent need for information on this subject. A description is also included of two techniques in making service tap-connections on to aluminium conductor distribution cables now being widely used on the Continent.

Straight Through Joints—Stranded Cables

(1) Cut abutting conductors so as to leave approximately ¼ in. between ends. This is to facilitate the flow of flux and solder along the interstices of the strand.

(2) Remove insulation from the ends of the cores for the required distance (half length of ferrule plus ½ in. is recommended) and tape up in the normal manner.

(3) Insert a metal probe or screwdriver into the centre of the strand and work about so as to effect a general loosening and displacement of the wires. After this operation the strand should present a slightly "bellied-out" appearance (Fig. 3).

(4) Preheat the conductors by liberally basting with solder (see Table) at a temperature of 300°C ± 20°C.

(5) With the aid of a small stiff brush, quickly apply a liberal quantity of organic flux (see Table) to the cores, paying particular attention to the underside.

(6) Rebaste cores with solder. It will be noticed that immediate "tinning" takes place. More flux and solder may be applied until the whole of the conductor, particularly the underside, exhibits a bright, well-tinned appearance. Wipe off excess solder.

* Aluminium Laboratories, Banbury.

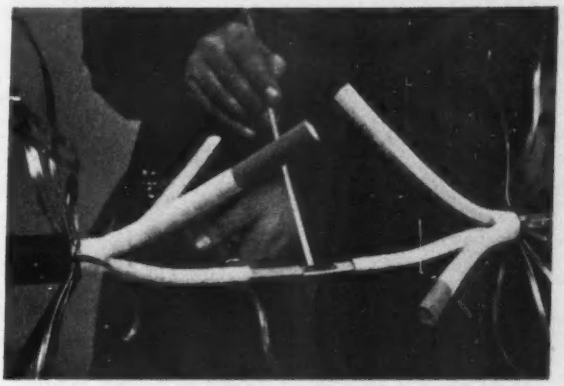


Fig. 1. "Tinning" a solid conductor, using an abrasion solder and gas torch, first stage in a straight through joint

(7) After the "pre-tinning" operation, apply a small amount of flux to an appropriate size of "hot tinned" copper weakback ferrule and immerse in the solder pot to acquire a freshly "tinned" surface. Apply the ferrule centrally over the conductors and close firmly, but not completely. It is important to note that "electro-tinned" copper fittings are unsatisfactory on both aluminium and copper cables; "hot-tinned" fittings only should be used.

(8) Apply a little more flux to the joint and baste with solder until it is seen that solder is running freely through the assembly and presents a bright, well-tinned appearance.

(9) Close ferrule tightly and continue to baste from ladle to ladle until the solder begins to harden. Wipe off excess metal with a clean tallow-impregnated cloth.

A similar application of flux and solder is made for cable terminations which are otherwise made in accordance with standard jointing procedure.

A typical cross-section of a joint made in this manner is shown in Fig. 3. This clearly shows the good solder penetration which has taken place. Laboratory tests on such joints have revealed the following characteristics:

(a) The joint has an electrical resistance less than half that of an equal length of conductor.

(b) The tensile strength at 20°C is equal to or above that of the conductor. Fig. 2 shows a typical specimen in which tensile failure had occurred in the conductor away from the joint.

(c) The tensile strength at 120°C is approximately 65% that of the conductor strength.

Straight Through Joints—Solid Conductors

The solder basting technique described above can be used without modification for joints on solid conductors. As there are no interstices in a solid conductor, the "pre-tinning" operation before application of the weakback ferrule is simplified. Normally, only one application of flux and one solder baste is sufficient. Thereafter the jointing

† ELECTRICAL TIMES, 13 April, 1961, page 583.

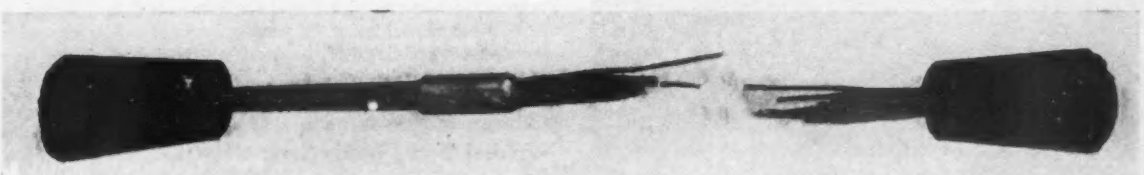


Fig. 2. Result of a tensile strength test on a standard aluminium conductor showing that the joint is stronger than the conductor. Solid conductor joints show similar characteristics

Fig. 3. Stages in the formation of a joint by basting techniques. From top to bottom, opening out the strands; preheating the conductors by basting prior to "tinning," applying the ferrule; and making the joint. The lower picture of a sectioned joint shows the penetration of the solder

procedure is identical to that for a stranded conductor. Tests have established that soldered joints on solid conductors made in accordance with this procedure are as sound, both electrically and mechanically, as those in stranded conductors.

While solder-basted joints are reliable and simple to make, jointing of solid conductors can be simplified even more by using so-called "fluxless" or abrasion solders which have been introduced in Germany, USA and the UK (see Table). It is believed that these solders, with their simplicity of application, will in time come into general use with solid conductors.

Method of Application

(1) Line up and set the conductors to be jointed and so cut them that a gap of $\frac{1}{16}$ in. is left between the ends.

(2) Remove the insulation from each conductor for a distance equal to the length of appropriate weakback ferrule. This applies to both paper and plastics insulation.

(3) Tape up the insulation on each core with heat-resisting glass-fibre tape.

(4) Gently heat the exposed conductors with a gas torch. A propane gas torch in which both flame dimension and force can be controlled is recommended to prevent damage to the insulation.

(5) Rub the abrasion solder firmly over the heated conductor until "tinning" is effected. This will occur when the conductor is at a temperature between 250°C and 300°C (Fig. 1).

(6) Wipe off surplus solder and make a visual inspection to ensure that all parts of the conductor are properly "tinned."

(7) Heat a copper weakback ferrule (hot-tinned, not electro-tinned) in the flame and apply it centrally over the conductors, slot uppermost. Close tightly with grips.

(8) Tape up the ends of the ferrule and adjacent conductor with glass-fibre tape. The latter should be applied tightly to avoid gaps through which solder can subsequently run.

(9) Heat the joint assembly and feed in solder through the ferrule slot. Normal "tinmans" solder, which is cheaper than abrasion solder, is quite suitable for this operation.

(10) Tap the assembly from time to time to assist solder penetration and continue feeding in the solder until the ferrule will accept no more.

(11) As the assembly cools and the solder begins to harden, wipe off surplus with a tallow-impregnated cloth to leave a smooth, even surface.

This jointing technique can, of course, also be applied without modification to cable terminations.

Service Tee Joints

It is noticeable that, whenever jointing techniques are being described and demonstrated, the emphasis is always on a straight-through joint, though by far the most used joint is the service "tee" connection. For this reason little appears to be generally known about continental practices on tee connections, though some are undoubtedly of interest to many British cable engineers. Before describing them, however, it must be emphasised that they are only alternatives and both of the methods described above may be, and are, applied without difficulty to making tee connections as standard UK practices.

Welded Tee Connections

Probably the most popular method of joining insulated aluminium conductors in Germany is by flame welding, using oxy-acetylene or oxy-propane fuel. Whilst there is

no doubt that fusion-welded joints of this type are completely reliable, it has been argued by several British engineers who have examined the technique that it demands too much specialised skill from the jointer and that the heat damages the insulation. This may be true of straight-through joints, but the argument cannot wholly be accepted in relation to welded tap-connections which, in terms of simplicity, speed of application and reliability, are hard to equal. The following description applies to both stranded and solid aluminium conductors.

(1) Prepare the main and service cables in the usual manner. It is desirable to part the cores of the main cable as much as possible, since the amount of core insulation to be removed is greater than normal. The conductor should be bared for approximately 3 in. at the point of connection.

(2) After taping and forming the main and service cores, place the bared end of the service conductor against the main conductor (Fig. 5) and hold in position with a flame-deflection clamp. These spring-loaded clamps serve not only as a barrier to prevent the flame damaging the insulation, but also as a heat sink to restrict insulation damage by conducted heat.

(3) Insert asbestos sheet between the cores to protect the insulation on other phases against flame damage and affix another flame-deflector clamp as shown in Fig. 5.

Table. Materials for Welded and Soldered Joints

BASTING SOLDERS AND FLUXES		
Flux	KYNAL	Fry's Metal Foundries Ltd.
	ALGLO	W. and T. Glover and Co. Ltd.
	T58	Fry's Metal Foundries Ltd.
Solder	ALCA "P"	Fry's Metal Foundries Ltd.
	AMALGAN 9	Grey and Marten Ltd.
	ALGLO 30	W. and T. Glover and Co. Ltd.
Ferrules	Standard copper weakback, flow-tinned	B.I.C.C. Ltd., A.E.I. (Henley's) Ltd.
ABRASION SOLDERS		
	TIN-A-LUM	Industrial Synthetics (Overseas) Ltd.
	UNIFLUX	Uniflux (London) Ltd.
	FRYAL	Fry's Metal Foundries Ltd
WELDING		
Filler rod	ALUMINIUM (Commercial)	British Oxygen Co. Ltd.
Flux	ALDA ALOTECTIC	British Oxygen Co. Ltd.
BRAZING		
Filler rod	ALUMINIUM (10-12% Si)	British Oxygen Co. Ltd.
Flux	ALDA	British Oxygen Co. Ltd.

(4) Apply a small amount of flux (see Table for materials) to the joint assembly and to the filler rod.

(5) Adjust the oxy-propane or oxy-acetylene torch to give a thin pencil of flame, then heat the end of the tap conductor and main conductor simultaneously. When heated sufficiently, feed in metal from the filler rod to the joint area. This operation should last approximately 30 sec.

In Germany, where this technique is widely used, the aluminium filler rods are made of the same material as the conductors with a melting point of 659°C, while the flux is of a type commonly used for the flame welding of aluminium. The operation is, therefore, just welding. Recent experiments in Britain have shown, however, that, by using a filler rod of aluminium with a 10% to 12% silicon content (melting point 585°C) and a standard aluminium brazing flux, the maximum temperature reached during the jointing operations can be considerably reduced. This technique is one of brazing rather than welding. It has been tried successfully without the aid of cooling clamps and the degree of insulation damage was negligible.

One important aspect of this method is the portability of the heating apparatus. In Germany, neat light-weight fuel bottles have been designed which fit compactly, together with the welding torch, into a wooden box about 18 in. square (Fig. 6).

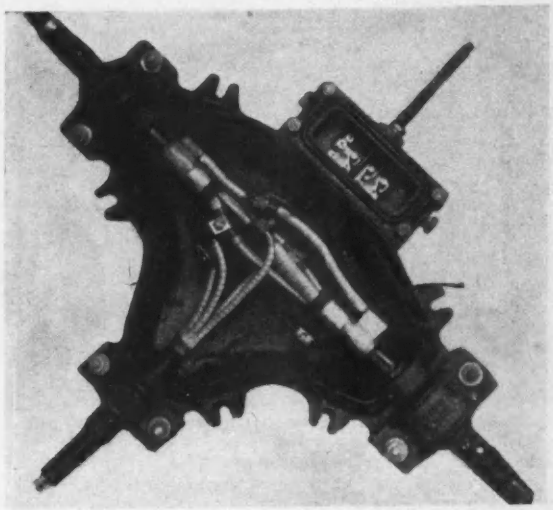


Fig. 4. View of completed tee-joint in joint box using bolted claw-clamp (Tatzenklemmen) type fittings

Mechanical Tee Connections

Another technique widely used in Germany for making service tee connections employs bolted claw clamps *(Tatzenklemmen)* of the type specified in the DIN Standards 47671 and 47672. More than 500,000 service joints incorporating these bolted connections are now in service in Germany and, so far as the writer is aware, there have been no instances of failure. The clamps comprise two crescent-shaped jaws which, when fully tightened around the main conductor, apply sufficient pressure to make and maintain good electrical contact without undue distortion of the strands.

For speed and simplicity of application, they are most impressive, though their bulk may demand a larger junction box than normally required. To connect the service conductor to this type of clamp it has been necessary to solder, weld, bolt or compress a lug on to the end of the conductor, the lug then being bolted on to the clamp. More recently, modified forms of these claw clamps have been developed in which the service conductor can be contained, under pressure, in the body of the clamp, obviating the need for terminal lugs on service conductors.

Cable engineers in the electricity supply industry in this country are strongly urged to make a careful study of the *Tatzenklemmen* types of fittings, since their introduction

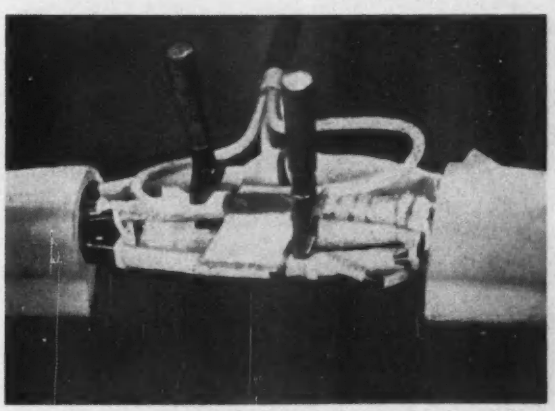


Fig. 5. Tee-connection ready for flame welding showing flame deflection clamps and asbestos board in place

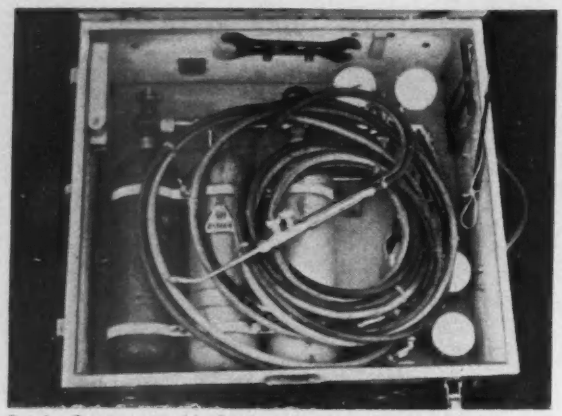


Fig. 6. Compact portable flame welding equipment in carrying case as used in Germany

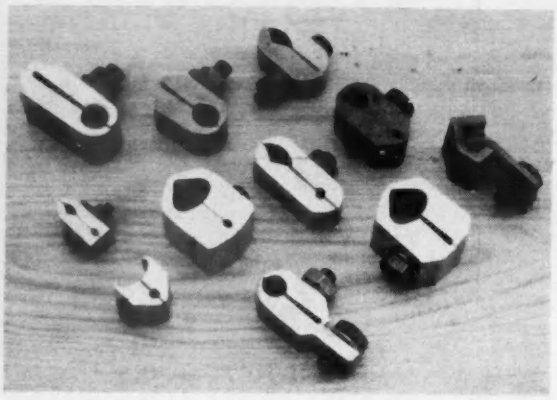


Fig. 7. A range of recently developed bolted clamps for both solid and stranded conductor connections

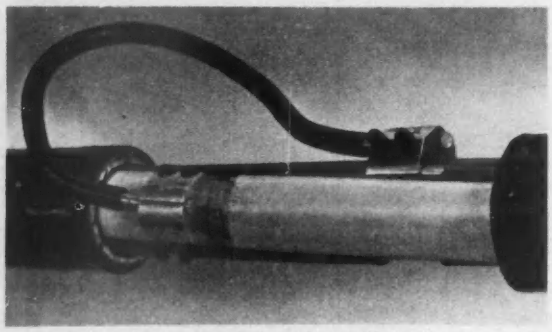
would undoubtedly reduce the time and cost of making house service tap-connections. To sceptics who may doubt the efficiency of bolted fittings on aluminium conductors, one can only say that *Tatzenklemmen* fittings have been fully proven both in service and in the laboratory. Moreover, there must be hundreds of thousands of bolted fittings on aluminium overhead distribution lines which have given several years' satisfactory service. Some types of the bolted clamps now available for solid and stranded conductors are illustrated in Fig. 7.

Dermatitis Risks

From time to time reports have been received of jointers contracting dermatitis through using the organic fluxes employed for aluminium cable jointing. Dermatitis has always been a health risk associated with cable jointing, both on copper or aluminium and results from contamination of the skin by mineral oils, i.e., insulation impregnating compounds and the bitumen in servings and cable boxes, with which jointers come into almost daily contact. It is aggravated by the unfortunate habit jointers have of "washing" the oil and bitumen from their hands with paraffin, which is notoriously harmful to the skin. If, in fact, the incidence of dermatitis is higher when using aluminium fluxes, then it is because of the more frequent cleaning of the hands with paraffin. This practice is bad. The correct procedure at the end of any jointing operation is to wash the hands in water. Soap and clean water should be available close to every jointing operation.

New Clip-on Service Connection for Solidal

IN the field of cable jointing, the common house service joint accounts for by far the largest number of jointing operations. With conventional type underground cables, the jointing operation is comparatively slow and the average number of service connections a day is, even now, only expected to work out at two. Part of the study of distribution cables and jointing practices carried out by Aluminium Laboratories Ltd., which has resulted in the introduction of the plastics-insulated, solid aluminium conductor cables, under the name of "Solidal," has been into the various methods of service-to-distributor connection which will enable efficient jointing at a minimum of cost and time to be effected. In the previous article, details of jointing practices which are suitable for solid core cables are described, and reference is made to the clamp type of connection in use in Germany.



The new service clamps as applied to adjacent "Solidal" conductors for short-circuit evaluation tests

A British range of similar clamps developed by Erma Ltd., in association with the Aluminium Laboratories, has recently been under an extensive series of tests conducted by the ERA. The clamp is formed of two pieces of extruded aluminium section held together by high tensile steel screws. When clamped together, the two halves grip both service and distribution conductors simultaneously and the design is such that only very slight separation of the cores is necessary. The cycling tests comprised 10,000 cycles of 30 min heating followed by 30 min cooling at currents which gave a maximum conductor temperature of 85°C−10° in excess of that allowed for in the present specification for p.v.c. insulated cables. Resistance measurements taken at intervals show that the joints are electrically stable. Simulated short-circuit tests carried out by the ERA on clamps attached to intermediate sizes of cable have also been satisfactory. In one instance a short-circuit current of 10,700 A for 0·09 sec melted the service conductor but the joint remained stable.

Further tests are in hand for 400 A cables (0·471 sq in.) and a number of trial house services using the clip-on clamps have been installed by area boards in Britain and also on the continent. A considerable reduction in connection time has been achieved by use of the clamps.

Refiring grit at Kingston

FUEL ECONOMY PROGRAMME CUTS GENERATION COSTS

STEADY reduction in the proportion of coal fired has been a feature of the operation of Kingston power station, in the South Thames Division, CEGB, since its commissioning in 1948. The change is shown in Fig. 1. Latest advance in this progress has been the refiring of grit removed from chimney emissions.

Kingston power station is equipped with four 30 MW BTH sets and six 285 klb/hr Stirling boilers. The boilers have chain grate stokers. There is also a 3 MW house set. In the year ended 31 March, 1960, the station generated 634 million units at 23·72% efficiency.

Kingston was designed to burn coal from the north east coast, transhipped from colliers at Littlebrook power station. This coal, if used today, would cost 96s 7d/ton on

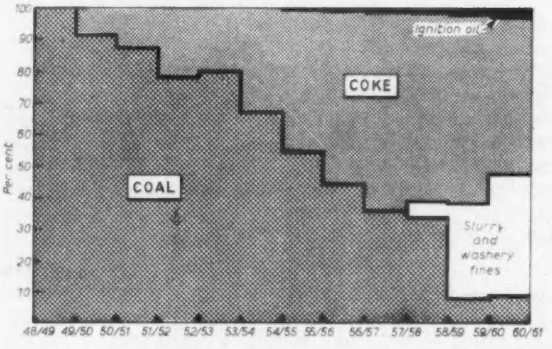


Fig. 1. Percentage make-up of fuel burnt at Kingston, 1948-1961

the 10,000 B.Th.U/lb basis. Station cost per unit sent out would be 0·74d, whereas it is 0·54d with the present fuel arrangements. This low cost has raised the position of the station in merit order, and has caused its load factor to increase sharply. Kingston in 1959-60 operated with a load factor of 58%, against 43% national average and 29% for one station of similar design and age.

When the station was first commissioned, coke breeze was mixed with coal of good quality in proportions up to one in three and the mixture burnt. This is normal practice where coke is available. If it is desired to increase the proportion of coke breeze burnt, three principal problems are met : ignition, control of grit emissions, and collection and disposal of fine ash and grits.

There are two ways of tackling the ignition problem. Hot gas can be recirculated, or oil injection may be used to heat up the fuel. At Kingston the two methods are used together, and Fig. 2 shows the positioning of the effects to ensure that the fuel bed ignites near to the point where it enters the furnace.

Addition of fine coke to the fuel causes extra grit to travel towards the chimney. The original design of the station was carried out with close attention to amenity considerations as regards chimney emissions. The provision of electrostatic precipitators in series with mechanical trapping plant permits the boilers to take lower grade fuel mixtures without grit trouble. However, the grit intercepted is unsaleable, and as the quantity rises, the cost of disposal becomes a burden equivalent to a rise in the cost of fuel.

Study of this problem suggested that there were advantages in briquetting the grit, for it contains about 60% combustible matter. Experimental work showed that briquettes could be made using low grade coal and pitch as a binder. Using a mobile briquetting plant, briquettes

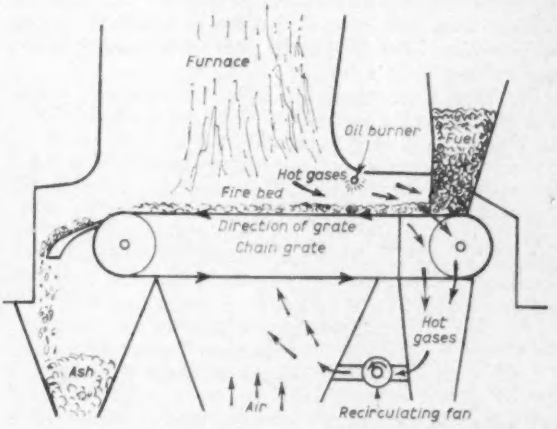


Fig. 2. Hot gas recirculation system to improve fuel ignition

worth 61s/ton in heat content could be made for 28s/ton.

On the basis of these tests, the CEGB decided that an investment of the order of £80,000 for briquetting was justifiable. Experience so far suggests that this outlay should be covered in five years.

With the briquetting plant in full scale use, the monthly cost of dust disposal has fallen from about £800 in April, 1960, to £70 in April, 1961. At the same time, monthly profit from the sale of clinker has increased from £1,800 to £2,600.

Briquetting Plant

The briquetting plant begins with a vacuum plant which collects dust which was formerly sluiced to the main ash bunker for disposal. This dust and grit falls from a hopper on to a conveyor belt which also passes under a coal hopper where the appropriate amount of raw coal is added. The mixture then passes to a double paddle mixer, and after anthracene and pitch have been injected, to a pug mill. After milling it is cooled in a worm wheel and passed to a device which distributes it evenly on briquetting rolls. The briquettes which fall from the rolls are then allowed to harden on a cooling conveyor before they fall on to a stock heap.

Readers Views

Correspondents writing under pseudonyms are asked to submit their names and addresses in confidence to the Editor

Off-peak Heating Design

MR TIBBS raises an interesting point (Readers' Views, 20 July), but other evidence available from buildings heated electrically by hot water systems does not bear out the suggestion he makes.

The HVRA report suggests that approximately 60% of the "normal" calculated annual heat requirement is used by a floor-warming installation, whereas figures from hot water installations show the figure in their case is about 50%.

With any form of heating system that maintains occupational temperatures 24 hours a day, it seems probable that an "under-sized" heat input would be satisfactory, although not wise, because of the occasional extra-cold periods. I think this is borne out by the fact that, although 50% of the "normal" calculated heat requirement is used with electrically heated hot water systems maintaining temperatures day and night, approximately 75% of the similarly calculated heat requirement is necessary for the same building if working temperatures are maintained for eight to nine hours a day.

The HVRA report gives the seasonal average usages with floor-warming as 2,000 to 2,500 kWh/kW of design heat loss, which, as I have said, is slightly in excess of the consumption for similar buildings heated 24 hours a day by hot water methods. Unfortunately, although the report dealt with buildings occupied only during office hours, it did not deal with the consumption necessary for maintaining such buildings at occupational temperatures only during those hours. The figure in that case would be between 900 and 1,000 kWh/kW of design heat loss.

S. A. Williams, A.M.I.H.V.E., M.AMER.I.E.E.,
MANAGING DIRECTOR,
BASTIAN & ALLEN LIMITED.

The Right Equipment

FOLLOWING my letter (22 June) regretting the unavailability of a 10 A weatherproof switch-fuse, Dorman and Smith Ltd suggest (13 July) that the answer to my problem is available in the form of a suitably housed miniature circuit-breaker.

I would respectfully suggest that this is a purely personal solution to the problem, in view of the controversy which was aired in the ELECTRICAL TIMES some time ago regarding the relative value of m.c.b's or fuses.

I have experienced a case where an m.c.b. failed to trip when carrying a current which would normally have blown the appropriate fuse.

This happening has further caused me to "hold my horses" until such time as m.c.b's have become more generally acclaimed as a replacement for the time-honoured switch-fuse, while it must be admitted that the m.c.b. is a much more convenient way of getting the wheels turning again.

L. Giltrow,
VIRGINIA WATER,
SURREY.

Representatives Call

THE letter by *Sales Representative* in a previous issue was one that I was pleased to read. *Sales Representative* has raised a point that has of late become very important to the thousands of salesmen on the road who call on electrical wholesalers. The remarks of Mr Strangways suggest that he has not a very extensive knowledge of commercial travellers. He sounds like the member of one of the large firms or combines whose card ensures a reception at every call. These firms who show the "Sales Representatives only seen by appointment" card will see him if he is one of the "big noises." The mention of a salesman only calling on those firms who would reply to a letter requesting an appointment would limit the salesman to about a couple of weeks work per annum.

As one who has covered every sales area in this country for various firms and products, I can claim to have a good knowledge of the wholesale trade. Most salesmen have the printed advice card which is sent out to announce their call, but this means nothing to the firm, as they are often turned down just the same. It is the fact that a firm who have sales representatives on the road soliciting business should in turn refuse to see other firms' reps who have products to sell which could be of interest that offends. "No reps to be seen except by appointment" is a growing menace to the salesmen, and the Electrical Trades Commercial Travellers' Association should take note of it, and do something for their members who must in many cases be the victims of this commercial apathy. It is better for an association to approach a firm on behalf of their members than the one man, who is forever cut out because he has complained.

M. C. Toner,
STOCKPORT.

Off-peak Costs

IT is refreshing that your journal has the courage to raise the breath of criticism on the problem of off-peak costs particularly as applied to floor heating, under your editorial, and also in a recent letter from the managing director of Hurseal Ltd.

We have had similar difficulties in our attempts to obtain a more enlightened approach to this problem by the electrical supply industry, and we agree most heartily that the industry should examine thoroughly the whole question.

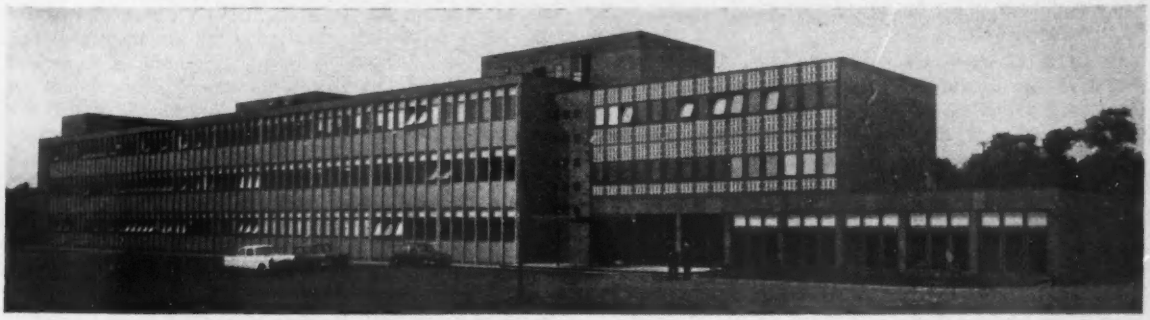
The suggestion made by Messrs. Hurseal would go a long way to solving these problems, and various members of this organisation have in the past put forward various suggestions of a similar nature in an endeavour to overcome the inherent difficulties:

(a) Providing a sound heating system.
(b) Taking a responsible attitude to what is a national problem.

We have endeavoured, on many occasions in the past, to discuss these problems with the supply authorities, but they appear to be extraordinarily unimaginative, particularly with regard to the running costs which, of course, have direct bearing on the tariff structures.

The supply authorities have only themselves to blame for the problems, which are largely their own making and it will be interesting to see if comments, such as your editorial, and this letter, will prompt a more imaginative approach to the problem.

A. C. Meech,
DIRECTOR, HEATING INVESTMENTS LTD.,
LONDON, N.3.



Research at Rugby

OPEN DAYS AT THE NEW A.E.I. (RUGBY) LABORATORIES

IT must have been with a pardonable feeling of pride that Mr L. J. Davies, C.B.E., M.A., B.SC., M.I.E.E., director of the new research laboratories for AEI (Rugby) Ltd., welcomed the first of his guests at the open days held there on 14, 15 and 17 July for, though research has been carried on in the company's laboratories since, as BTH, they founded the first in 1924, it has been under his direction over the past 16 years that the most significant developments have taken place, culminating in the completion of these excellent, well-designed and fully equipped buildings. One must not, of course, forget the pioneer work of the late Mr R. C. Clinker or that of the late Sir Hugh Warren, who guided the laboratories through the war years when expanded researches on centimetric wave equipment and radar had to be carried out in rapidly constructed temporary buildings scattered all over the place. But it was this legacy of scattered facilities which Mr Davies inherited and welded together in the new accommodation at a time when developments in the electronic field were crowding in at an alarming pace. For example, about seven-tenths of the devices shown were on, or based on, principles and materials completely unknown when he took over or, at the most, only vague ideas in the minds of a few physicists and experimenters.

The Buildings

The laboratories are situated on a 7-acre site in pleasant surroundings away from, but within sight of, the works which they serve. The building is 370 ft long and provides some 45,000 sq ft of accommodation for offices, laboratories, conference rooms, library and amenities on three floors. Apart from the entrance hall, library and administrative offices, which occupy a wing on the right of the main building, all of the working areas are designed to be completely flexible and capable of being broken up or down into small or large rooms, each with a full complement of services, by movable partitions, solid in appearance and fairly soundproof. A high level of natural lighting is provided by double windows, with recessed fluorescent lighting for evening and night work.

A three-phase insulated electrical busbar system surrounds the building behind the outer wall panels from which tappings are taken to 13 A three-pin sockets for electrical services in the partitions and benches. Tappings are effected at special, closely spaced tapping points with a simple and effective isolating device and, as an additional safety feature, a thermal trip isolating switch for each tee-off. Access to the busbars is by small removable panels in the walls or, by removing the whole of a wall panel, to associated steam, gas, water and waste pipes.

Above the acoustic ceilings are supplementary steam heating coils for downward radiant heating, controlled from switches in the wall adjacent to the doors. For the main part, a plenum ventilating and heating system, thermostatically controlled, supplies clean, filtered and warmed air to each room through roof inlets, exhausting through low level grilles in the door panels to the passage which acts as a ventilating outlet duct.

Laboratories of any size can, therefore, be created at a few hours' notice, suitably equipped with working surfaces and all necessary services for any research programme, even those calling for the cleanest of air conditions.

Most of the equipment and experimental apparatus is constructed in workshops adjacent to the new laboratories, single-storey brick buildings which are part of the facilities originally set up for war-time electronic and radar research. Here are machine shops, fitting benches, glass-blowing rooms, drawing offices and general material stores. It is only a few yards away from the laboratories, so close collaboration between the scientists and the equipment designers is maintained.

Semiconductor Developments

Among the many exhibits displayed were a number on semiconductor developments, including current investigations into lead and germanium telluride devices and the even more recent aluminium antimonide semiconductor materials. Production techniques and the study of the influence of doping on performance, particularly in relation to their application in thermoelectric generators, is being investigated by one group while, in an adjacent room, the construction of thermoelectric elements for incorporation in a generator is being carried on simultaneously. Here it was explained that the value of the latest semiconductors in such applications is the higher temperatures they could withstand. They have a low product of resistivity and thermal conductivity which, when combined with a high Seeback coefficient and hot junction temperature, gives a good figure of merit. Providing that the hot junction can be so made as to operate at a sufficiently high temperature, generation efficiencies comparable with that of a modern conventional thermal station should be achieved. A small experimental 10 W generator was demonstrated driving a fan motor with the

hot junctions in a gas flame and the cold junctions cooled by a water jacket.

Research on germanium and silicon type transistors is still a major interest and the construction of mesa type transistors, based on silicon, for power applications was demonstrated and described. Progress which has been made with silicon and germanium diodes in power rectification applications was shown alongside the development in the company's mercury arc rectifier business. By 1950, before semiconductor rectifiers were developed, the total output of mercury arc rectifiers manufactured by the company had reached 400 MW. Ten years later the total had risen to 1,800 MW, of which 500 MW comprised germanium semiconductor rectifiers manufactured over the latter six years. Today the figure is still higher but the trend is for semiconductor rectifiers to supplant mercury arc devices in the majority of power rectification schemes, with silicon rapidly overhauling and largely supplanting germanium in all but the heavy current electrochemical applications.

Transistorised Network Protection

Among other applications of transistors which are currently being investigated are their use as switching devices in power network protective systems and as commutating devices in electric motors. These were shown as laboratory "hook-ups," the commutatorless motor using sequential operation of semiconductor switches in the stator circuits with a d.c. excited rotor, the timing being controlled by an inductor system coupled to the motor shaft.

The arrangement of the power network protective system was also of the "breadboard" pattern but clearly showed how static transistor type relays could be used to replace conventional types, so dispensing with moving parts and contacts, in overload protective circuits and also in switched distance protective networks for power lines. Less intriguing but equally practical were the applications of silicon controlled rectifiers to the regulator of brightness of a 3 kW, 250 V tungsten filament lamp and to the reversing control of a small d.c. motor using conventional thyratron, clipped wave, principles.

Gas Discharge Phenomena

Another aspect of the work being carried on in the laboratories is a series of studies of gas discharge phenomena, particularly in relation to their effect on fluorescent lamp design. The basic theoretical investigation is an attempt to evaluate mathematically the characteristics of the discharge under varying potentials, gas pressures and temperatures. In one experiment, the potential drop is being plotted along the arc discharge, maintained at a constant temperature by a water-cooled jacket, by the conventional method of inserting probes through the walls of the envelope into the arc. A discrepancy in former experiments has been ascribed to the deposition of impurities on the probe tips during the period of arc maintenance. In the present investigation, this is being overcome by momentarily heating the tip to red heat immediately prior to taking the readings. Already an initial detailed theory has been worked out on the mechanism of gas discharges which has involved complicated mathematic calculations only possible with the use of digital computer techniques.

In the study of phosphors, the effects of temperature on colour are being examined with different base phosphors. Here a side-by-side comparison of colour is being made between two halves of a fluorescent tube, one half of which is heated to a temperature appreciably above that of the other by a surrounding heating spiral. As a useful design study, a neat, compact form of fluorescent lamp is also being developed which is, in effect, a 5 ft tube folded six times to provide a square light source of comparable output and efficiency. The construction, however, is based on edge welding two square glass plates with the labyrinth impressed in their surfaces. Electronic valve researches include studies leading to the design of new valves for high current—of the order of tens of thousands of amps—hydrogen filled thyratrons and the mercury pool ignitron used for control purposes in thermonuclear research apparatus. A study of the factors causing backfires in mercury arc retifier devices is also currently in hand.

Arc Furnaces and Mains Flicker

A typical problem under examination has been the effect of operating a number of arc furnaces simultaneously on the supply mains. It has been noticed that there is a relationship between the number of furnaces in operation and the frequency of flicker impressed on supply mains and it has been stated that this frequency of the order of $\sqrt{2}$ times the number of furnaces. More recently it has been suggested in the USA that the factor is $\sqrt{4}$ and not $\sqrt{2}$. An investigation carried out on a small facsimile circuit, in which miniature mercury arc discharge tubes served as arc furnaces, has confirmed the figure $\sqrt{2}$ and has also given rise to a study of the magnitude of the flicker peak voltages to be made.

In the examination of materials, electron microscopy, X-ray analysis and mass spectrographic methods are used, while radiochemical methods, using radioactive tracers, are being employed to study distribution and diffusion of impurities and doping constituents in semiconductor crystals. Among the studies into insulation and insulating techniques is an evaluation of the method of coating conductors with a thin, even and consistent covering of insulating resin by immersing the previously heated component into a fluidised bed of the resin powder held in suspension by the passage of an inert gas through it.

The laboratories are also concerned with the development of new devices, two examples of which, an electrostatic flue-dust monitor and a 10 kW electron beam furnace, were on display. In the former, a hollow tube in the shape of a capital C is inserted in the gas flue with the major axis in line with the flow. Dust particles enter the orifice at the tip of the lower extremity and are circulated around the monitoring device in the back of the unit, finally emerging in line with the flue-gas flow from the upper extremity which is belled to compensate for flow losses in the tube. Kinetic energy required to maintain circulation is derived from that in the flue-gas alone. Dust particles in transit gather an electrostatic charge from a high potential probe on the lower end of the monitoring device and dissipate it on a collector shield at the upper end. The accumulated charge, dependent on the number of particles passing per unit of time, is measured and recorded electronically at frequent intervals. The device is so sensitive that fine carbon particles in cigarette smoke give an instantaneous reading. A prototype has been in service at Hams Hall (CEGB) for the past 20 months. The electron beam furnace was developed in the laboratories for the UKAEA, Culcheth, in the short space of eight months.

Among the many distinguished visitors during the open days were Lord Chandos, chairman of AEI, Sir John Cockcroft, Sir Willis Jackson and the president of the IEE, Sir Hamish MacLaren.

NOTES ON WIRING

BY MEGOHM

A DISCUSSION on the preparation of specifications is always interesting, especially when a member of the company is an estimator with a contracting firm. Those who prepare specifications are inclined, probably unintentionally, to cause the estimator more work than is really necessary. Schedules are normally bound into the specification itself and this was the cause of some of the criticism. The estimator in question suggested that at least the switchgear and fusegear schedule could be set out on one of the drawings so that the whole story of the requirements of the job are at hand and there is little or no need to turn to the specification so often.

I don't know how this would work in practice, for the completed specification is regarded as the "official tender document" and is retained as such by the client. Of course, the tender drawings are also signed and retained, so perhaps that is insufficient objection to the idea.

I must admit that some specifications I have seen consist of more "condition" clauses than technical clauses, and not set out in a way that a dividing line between them is apparent. The two types of clauses are often mixed up together and this leads to a lot of "sorting out." Perhaps the people who prepare specifications expect the contractor to do such sorting out as part of his job. In these days of heavy labour costs the more one does to cut down estimating time the better. I hope to try the suggestion of putting the schedules on to drawings instead of into a specification and watch the results.

Evening Workers

I have noticed a steady increase, in my locality, of advertisements in the local papers and shop windows notifying the public that someone or other is available in the evenings and weekends to rewire their houses, install extra sockets and fit immersion heaters, etc. Being a little bit curious, I investigated the matter and found that most of these were skilled men working from home in the evening and employed by a contractor during the day. One of these people had a shed in his garden full of odd lengths of cable, switches and other accessories. On a bench lay certain pieces of switchgear in the process of being dismantled, cleaned, painted and got ready to sell as new. Business, I was told, was booming!

I went along to see several of these people on the pretence of needing a few points rewired in my house. The first one spotted my motives and said that he had enough work in hand. The next one got really worried when I started asking for some technical details and then went white when I pointed out that I must have his assurance that he was insured against accidents and that I required a proper invoice in order to claim against my house tax. I was informed that he worked for cash and gave no receipts! I assume that he gave no guarantee for his work either.

Here is another menace to householders, almost as bad as the amateur wireman, except that the completed work *should* be safer. An unsuspecting householder might, however, land himself in trouble by employing such a person. For instance, if he allowed the electrician to use the household step-ladder and this broke and the man was injured, there could be a claim made against the householder. At least, that is how I see it, for I have read of similar cases involving window-cleaners and always understood it was risky to employ such "casual labour." Apart from all that, this sort of thing is bad for the trade but there appears to be little possibility of stamping it out. If these people wish to be their own bosses, then let them start up in the correct manner. I do not intend to comment on the matter concerning where their materials come from!

Immersion Heaters

When my electricity account arrived recently, in addition to closing my eyes with shock at the amount of the account, I carefully checked the units consumed, for at the start of the quarter I had installed a time-switch on my immersion heater. This was set to operate the heater for two hours in the mornings and three hours in the evenings. I am rather disappointed in the results and have saved very little in actual £:s:d but gained quite a bit in comfort and convenience. On the face of it, I thought that a reasonable saving might have resulted from the experiment. Previously the heater was manually controlled and was, consequently, often left switched on unintentionally. Now I find that I am more conscientious in switching the heater off after I have put it into use out of its normal "working hours." I might mention that the length of draw-off to the farthest hot water tap is approximately 20 ft.

I know that many people are interested in the economics of water heating by electricity and there are widely varying opinions on the subject, yet I find it difficult to tie the matter down satisfactorily. It seems that I must experiment further, despite family opposition.

Circuit-breaker Installations

Are we in this country going to see more installations equipped with circuit-breakers instead of the fuses we know so well? I feel that we are and once the public authorities decide to move on the matter and relax their fixed ideas on circuit-breakers I feel that the trend will increase. No doubt there will be arguments for and against, but there is much to be said for c.b's. I know of a school which is being rewired shortly and m.c.b's and c.b's will be used throughout; and one of the persons most pleased about it is the school steward. He visualises a rest from repairing fuses which he knows little about and found irksome. I don't blame him, in some ways, for thinking along these lines. A school, in my opinion, is the ideal place for c.b's to be used. I have seen odd sizes of fusewire used in old schools where some of the staff have used apparatus too heavy for the original fuses and stepped up the size of wire. The budding actors in schools are also good at such alterations and I did come across an overhead batten having three circuits wired internally, served from a close-by three-phase and neutral supply, the connections made in a slipshod manner and merely taped with insulating tape. With c.b's I feel that some of these dangerous practices may be stopped.

Power costs for farms

S.W.E.B. INVESTIGATE ELECTRIC FARMING ECONOMICS

FARM electrification has been the subject of much pro-electrical propaganda. Experimental facts of costs and advantages have been less easy to come by. To put this right, the South Western EB has carried out experiments in conjunction with four farmers who were willing to take mains electricity, comparing costs before and after the change-over. Two reports issued last week summarise the results. One is from the SWEB: the other an independent report of the Department of Economics of Bristol University.

Not surprisingly, the conclusions in the SWEB report are the more outspokenly enthusiastic about the advantages of electrification. But both reports conclude from the mass of statistics produced, that electrification is a good thing for the farmer.

In the words of the Board, the report indicates how the many farmers already connected to the electricity mains and those now being afforded a public supply, can, by making a good and wise use of electricity, produce a worth-while return on their capital investment and, at the same time, help the electricity boards.

For Bristol University, the summarising of the statistics leads to the conclusion, sombre at first sight, that "the estimated direct cash return on this investment" (i.e., in electrical equipment, wiring, etc.) "is approximately nil. . . . On the other hand, the use of electrically powered equipment is likely to make a worth-while contribution to the ease of running these farms and to their productivity. The probable cash value of advantages of this kind represents a good return on the initial cost of the change."

TABLE 1. Annual Cost of Farm Energy, 1960

	Units Consumed	Unit Charge	Fixed Charge	Assessed R.D.C. *	R.D.C. Paid	Total Cost
		£	£	£	£	£
Farm A (d. per unit)	30,102	141·1 (1·125)	17·3 (0·14)	23·3	†—	158·4 (1·26)
Farm B (d. per unit)	7,872	36·9 (1·125)	13·0 (0·40)	19·2	14·7 (0·45)	64·6 (1·97)
Farm C (d. per unit)	14,520	68·1 (1·125)	13·0 (0·22)	23·3	9·8 (0·16)	90·9 (1·50)
Farm D (d. per unit)	15,350	72·0 (1·125)	17·3 (0·27)	22·3	9·6 (0·15)	98·3 (1·54)

* The Rural Development Contribution is paid for 7 years only. (The period was later increased to 10 years.) † On Farm A the unit consumption was such that the refund was equal to the assessed R.D.C.

Table 2. Cost Comparisons Before and after Electrification

Details	Unit	Farm	Before	After
Power for milking	Cost/cow	A	£0·78	£0·20
		B	£1·69	£0·44
		C	£1·77	£0·29
Hot water and steam	Cost/gallon	A	4·6d	1·7d
		B	1·01d	0·76d
		C	0·95d	0·69d
Water pumping	Cost/1,000 gal.	C	35·9d	6·6d
		D	—	8·7d
Milling and mixing feed	Cost/ton mixed	A	£1·63	£0·55
		B	£0·98	£0·84
		C	£2·75	£1·57
		D	£2·36	£1·02
Infra-red heating for pigs	Cost/sow	A	—	£1·54
		B	—	£1·29
		D	—	£1·38
Deep litter lighting	Total Cost	D	£17·8	£7·5

Table 3. Farm A—Costs before and after Electrification

	Capital Investment		Annual Charges (including Maintenance)		Fuel or Elect. Units		Total Charges		Labour (hours)	
	E	N	E	N	E	N	E	N	E	N
	£	£	£	£	£	£	£	£		
Generator	—	218	—	29	—	27	—	56	—	—
Steriliser and Water Heater	206	40	22	5	38	68	60	73	—	150
Washing-down Pump...	60	—	6	—	6	10	12	10	150	600
Mill/Crusher and Mixer	490	50	56	6	12	35	68	41	90	660
Grain Drier	380	40	44	6	50	29	94	35	—	120
Infra-red Heaters ...	20	—	4	—	8	—	12	—	—	—
Power Tools	120	—	14	—	1	—	15	—	—	—
Lighting in Buildings ...	30	—	3	—	1	—	4	—	—	—
	1,306	348	149	46	116	169	265	215	240	1,530

Table 4. Farm B—Costs before and after Electrification

	Capital Invested		Annual Charges (including Maintenance)		Fuel or Energy		Total Charges		Labour (hours)	
	E	N	E	N	E	N	E	N	E	N
	£	£	£	£	£	£	£	£		
Milking Machine ...	56	40	6	34	7	13	13	47	—	—
Water-heater ...	30	—	2	—	14	15	16	15	—	70
Mill and Mixer... ...	380	140	43	72	12	7	55	79	70	210
Infra-red Heaters* ...	32	5	9	3	43	10	52	13	—	130
Lighting in Buildings ...	92	—	2	2	1	1	3	3	—	—
	590	190	62	111	77	46	139	157	70	410

E = With mains electricity. N = Non-electrical equipment or private electricity plant. *Pre-electrical heating much less than electrical applications.

The Farms

Four farms were concerned in the experiment, not necessarily fully representative of the "average" farm of the south west; but also not hand-picked to show cheap electrical and dear pre-electrification conditions. The farms had their emphasis on sales of milk, with varied cropping and stock raising and substantial pig and poultry units. Sizes were 140, 160, 250 and 260 acres. All the farmers were, in the words of the Bristol University report, "serious commercial people intent on making a living for themselves and their families, and on doing well by the land."

In the SWEB, farms, on being connected to the mains, are required to pay a rural development charge, assessed on area, and payable for seven years. The charge is subject

to a rebate when the electricity consumption exceeds certain limits. The effect of this rebate is apparent in Table 1, which shows the cost of electricity during 1960. The SWEB tariff at the time in question charged 1¼d/kWh for farm supplies, plus a fixed charge related to assessed maximum demand.

Costs

At the heart of the experiment was comparison of costs before and after electrification. Just how the comparative figures should be set out is a choice from many possibilities. Table 2 presents some of the comparisons included in the two reports. The reports describe in much detail the changes made in the equipment of the farms as a consequence of connection to the mains.

Farms A and C had generating sets before mains electrification, farm A a 230 V, 3 kVA diesel alternator, farm C a 50 V, 2 kW diesel-driven d.c. machine with batteries. Average costs were 6·5d/kWh and 9·9d/kWh.

An attempt is made to evaluate, for each of the farms studied, the effect of introducing electricity. This is not based on direct comparison of one year with another but from an analysis of the various activities carried on in the farms. Tables 3 to 6 show the direct consequences in each of the farms. There are important indirect consequences to be considered; for, as already noted, it is these that clinch the advantage of electrification.

Considering farm A as an example, total power costs after providing for interest on capital and depreciation are about 6% up on the situation before electrification. The farmer also has to sink about 7% more capital in his business. The 1,300 hours saving in labour that results is about one-half of one man's time, which might affect the regular labour requirement to the farm.

Farm A includes among its new equipment an electric pressure pump for washing down the milking parlour. This seems more effective in cleaning the parlour than the former method. Although this improvement offers no clear financial advantages, it appeals very much to the operative who does the cleaning and, therefore, probably has some value in terms of a wage differential. Another example of indirect saving comes from the use of infra-red heating. If a sow produces 10% more piglets per year with infra-red heating, then the same amount of fattening can be done for 10% less sow cost. This represents a saving of £27. Again, the benefit derived from availability of electric portable tools on farm A is stated in the Bristol report to be "very noticeable." Clearly some monetary value should be placed on this.

From considerations such as these the value of indirect consequences on farm A is placed at a little over £200, on farm B at over £250, on farm C at £130, on farm D £290. These are figures given in the Bristol University report.

Overall Advantages

In their summary of the investigations, the SWEB put the average cost of electrical energy for farming purposes on the four farms at £95, with the extremes £77 and £124. An average cost per farm of annual capital charge and maintenance of equipment amounted to £106, giving total average outgoings of £201.

Before electrification, average annual capital charges, including maintenance of equipment later replaced, was £50, in case of fuel £196, making a total of £246. This showed an average annual reduction of £45, or about 17s/wk. This amount the Board admit is "marginal."

Table 7. Overall savings through electrification

Farm	Direct Cash Saving	Indirect Gains	Total Value of Gain	Saving in Labour
	£	£	£	(hours)
A	−58	200	142	1,290
B	18	250	268	340
C	178	130	308	—
D	44	290	334	310
Total	182	870	1,052	1,940
Av. per Farm	45	218	263	485

Savings in labour brought about by change to electricity vary considerably from farm to farm as the summarised results, Table 7, show. The time freed has been used for other profitable work on the farms and the effective saving works out at about £100/farm/year. Indirect savings on the Bristol University estimate amount to £218/farm, giving an average benefit to the farmer of £263/year, plus the labour saving, or £363/year in all.

Electrification means modernisation, and the Bristol University report quite properly points out that there has been no consideration of non-electrical methods of achieving such modernisation. However, it goes to say that whatever is happening on the four farms is typical of what is happening to agriculture generally. "Electricity is spreading steadily until it is available on a very large percentage of agricultural holdings. There is no question of going back in view of the many parts it has to play in the development of farming as a modern industry and as a vocation attractive to modern people."

Table 5. Farm C—Costs before and after Electrification

	Capital Invested		Annual Charges (including Maintenance)		Fuel or Energy		Total Charges		Labour (hours)	
	E	N	E	N	E	N	E	N	E	N
	£	£	£	£	£	£	£	£		
Milking Machine ...	28	24	3	8	7	54	10	62	—	—
Water-heater ...	32	8	3	1	21	26	24	27	—	—
Water Pump	58	36	6	6	12	58	18	64	—	—
Mill and Mixer... ...	480	—	55	—	6	115*	61	115	50	50
Dryer	400	—	44	—	40	60*	84	60	—	—
Wiring in Buildings ...	32	—	1	—	1	—	2	—	—	—
Generator	—	160	—	20	—	29	—	49	—	—
	1,030	228	112	35	87	342	198	377	50	50

Table 6. Farm D—Costs before and after Electrification

	Capital Invested		Annual Charges (including Maintenance)		Fuel or Energy		Total Charges		Labour (hours)	
	E	N	E	N	E	N	E	N	E	N
	£	£	£	£	£	£	£	£		
Water Pump	16	—	2	—	2	—	4	—	—	150
Mill and Mixer... ...	420	—	49	—	5	112*	54	112	20	90
Dryer	320	—	37	—	56	100*	93	100	—	—
Infra-red Heaters ...	20	—	6	—	22	—	28	—	—	—
Poultry Lighting ...	16	34	2	4	6	15	8	19	—	90
Lighting in Buildings ...	26	—	2	(2)	1	(1)	3	3	—	—
	818	34	98	6	92	228	190	234	20	330

E = With mains electricity. N = Non-electrical equipment or private electricity plant. * Former contract charges.

Personalities *in the industry*

Mr M. Davey

Dr S. Jones

Mr H. West

Mr F. E. Collins

Mr A. J. Sevenco

Newly appointed as transmission engineer to the Northern Division of the North Eastern Region, CEGB, is **Mr S. Smith,** ASSOCIATE I.E.E. (*ESH, page 70).

Formerly with the South Western Division, CEGB, as assistant divisional electrical engineer (design and construction), **Mr W. H. Campbell,** M.I.E.E., has been appointed assistant transmission project engineer at the South Western Regional headquarters (*ESH, pages 60, 63). Mr Campbell, who has served on various IEE and BSI technical committees, served with Metropolitan Vickers in various positions for 20 years before joining the South Western Division of the CEGB in 1948.

Formerly assistant marketing manager, portable appliances, with AEI-Hotpoint Ltd., **Mr Malcolm Davey** has joined Philips Electrical Ltd. as product manager in their recently formed Major Domestic Appliance Group.

Director of Research (Applications) to the CEGB since February, 1959, **Dr Sydney Jones,** PH.D., B.SC., A.M.I.E.E., has joined R. B. Pullin and Co. Ltd. as technical director (*ESH, page 49). With the CEGB he has been responsible for the development of forward-looking research projects, in particular, automatic process control systems. His new appointment follows Pullin's decision to expand through the whole field of electronics, electrics and electro-mechanics. Between 1947 and 1950, whilst he was at TRE, Dr Jones became interested in the problem of automatic guidance of astronomical telescopes and contacted Prof Tustin, of Birmingham University, who was then a member of a committee set up to advise on the proposed new 100 in. Isaac Newton telescope for Greenwich observatory at its new site in Hurstmonceaux. This led to his work with Professor Tustin at Birmingham on a scheme to develop a high precision servo-drive of the photographic plate on the Isaac Newton telescope. For this work he was awarded a Ph.D. About this time he was also leading the RRE team responsible for the application of infrared to guidance of missiles and other devices. This work led directly to the Firestreak missile. Many of the novel techniques in this missile arose from his work and in conjunction with the Ministry of Supply, he holds many of the patents involved. Dr Jones was superintendent of Defence Airborne Radar at Malvern, 1954-56, and headed the Armament Dept., RAE, 1956-59. In this capacity, he went to Christmas Island in 1958 and was an official observer at the last British megaton test. He received his education at Cardiff and Birmingham Universities and served a post-graduate course with GEC at Witton. In 1936 he became lecturer in engineering and physics at Birmingham, and from 1940 to 1946 was with the Ministry of Aircraft Production.

The new president of the Institution of Nuclear Engineers is **Sir John Duncanson,** and the vice-president, **Mr D. S. Watt.**

After 25 years as publicity manager to Crompton Parkinson Ltd., **Mr V. J. Faulkner** retires next week-end. His successor is to be **Mr E. F. Robinson,** who was previously assistant publicity manager and, before joining CP in 1954 held appointments in the publicity organisations of BICC and Johnson and Phillips Ltd.

Mr T. A. Uthwatt has been elected to the board of directors of Mather and Platt Ltd. He is head of the company's Research Department.

Mr R. N. Hamilton, B.SC.(ENG.), M.I.E.E., has this week taken up duties as telephone manager of the Colchester area, in succession to **Mr L. H. Brown,** who has retired. Mr Hamilton, who was previously area engineer of the Reading telephone area, entered the PO Engineering Dept. in 1931.

Mr A. J. B. Buckley, A.M.I.E.E., A.M.I.MECH.E., A.M.B.I.M., previously technical assistant with the Southern Division CEGB, has been appointed transmission engineer to the South Wales Division (*ESH, pages 61, 64).

Managing director of Associated Electrical Industries (Manchester) Ltd., **Mr H. West,** M.SC., M.I.MECH.E., M.I.E.E., was installed as president of the Institute of Welding for 1961-62 at the recent annual general meeting. Two new vice-presidents also took office at the meeting, **Mr C. Humphrey Davy,** M.I.MECH.E., director of Babcock and Wilcox Ltd., and **Mr L. Redshaw,** M.ENG., M.R.I.N.A., deputy managing director of Vickers-Armstrongs (Shipbuilders) Ltd. The following have been elected to the Council of the Institute: Messrs **E. V. Beatson,** B.SC.(ENG.), M.I.E.E., **M. Birkhead,** A.MET., A.I.M., **V. W. Clack,** A.M.I.MECH.E., A.M.I.PROD.E., **A. Evitts, S. H. Griffiths,** F.I.M., M.I.S.I., **J. Hooper, J. McLean,** and **R. Weck,** PH.D., M.I.C.E., M.I.MECH.E.

Mr H. Chisholm has been appointed a director of Ada (Halifax) Ltd.

The International Rectifier Co. (Gt. Britain) Ltd. announce several new appointments within their Marketing Department: **Mr F. E. Collins** is now representing the company in the Eastern counties. He was previously with the Rectifier Division of Standard Telephones and Cables Ltd. where he was responsible for the design of special rectifier equipments. **Mr A. J. Sevenco** has also recently joined International Rectifier and will be in charge of the marketing of

**Denotes revision to the "Electricity Supply Handbook, 1961."*

all high power products. He has always specialised in rectifier engineering, having been with English Electric Co. and lately with Lancashire Dynamo Nevelin Ltd. **Mr W. Thorn** is now responsible for the marketing of the range of medium power diodes and special products. He was previously representing the company in the Eastern counties. **Mr F. O. Wood** and **Mr H. C. Walford** have joined the Oxted office as customer liaison engineers. Mr Wood was previously with AEI Ltd., and Mr Walford with International Computers and Tabulators Ltd.

Formerly manager of the company's Telephone Apparatus Department, **Mr A. Robert Enshaw** has been appointed an executive director of the Plessey Co. Ltd. in charge of its Government Contracts Department. He joined that concern in 1946, and has been active in the field of contract work for the Post Office and in the affairs of the Telecommunication Engineering and Manufacturing Association.

At a meeting of the board of Hoover Ltd. last week, **Mr Oscar Mansager** relinquished his position as deputy chairman, but he remains on the board. **Mr Arthur F. Earle** has been appointed a director and elected deputy chairman in his place. Mr Earle, who is a Canadian, recently joined the Hoover organisation, after wide industrial experience in many parts of the world.

AEI Lamp and Lighting Co. Ltd. have appointed **Mr W. G. Creasy,** B.SC., as acting manager, Preston and Trent Vale GLS factories. He will be based at Preston, Lancs, and succeeds **Mr E. G. Fryer,** who died suddenly last month. Mr Creasy was previously superintendent of the Preston factory, a post he had held since 1956. The new superintendent is **Mr W. G. Ashworth.** On leaving London University in 1924, Mr Creasy gained experience as a chemist and, after four years, joined Siemens Electric Lamp Works, Preston, in a similar capacity. In 1940, he was made head of the Siemens tungsten wire factory, a position he held for 13 years until he was appointed assistant manager of the Siemens Lamp Works. He is a past chairman and secretary of both the Preston Scientific Society and the Preston branch of the Institution of Works Managers.

Assistant superintendent of the Large Electrical Department since 1958, **Mr K. R. Johnston,** B.SC.(ENG.), A.M.I.E.E., has been appointed assistant superintendent, Turbo-Generator Dept. at the Trafford Pk works of Associated Electrical Industries (Manchester) Ltd. He joined Metropolitan-Vickers Electrical Co. Ltd. in 1950 as a college apprentice, following technical education at Faraday Hse, London. He later became development engineer in the core-building section of the Metropolitan-Vickers Plant Department and in 1955 became manufacturing assistant in the core and winding section.

The Merchant Adventurers Ltd. have appointed **Mr M. F. Sillett,** DIP.M.I.E.S., as sales manager for the United Kingdom. He joined the company as personal assistant to the sales director, and has had some 11 years of experience in the lighting industry. He was previously manager of the lighting department of the General Electric Co. at Leeds.

District engineer in the Birmingham South East district of the Midlands Electricity Board since 1950, **Mr R. G. Worthing,** A.M.I.E.E., has been appointed manager of the Board's Solihull district. He will succeed **Mr J. A. P. Firth,** M.I.E.E., F.R.S.A., who is leaving to become manager of Birmingham SE district (*ESH, page 125). Educated at King Edwards School, Birmingham, he joined the staff of Birmingham Corporation Electricity Supply Department as a trainee in 1927 and became assistant meter engineer in 1932. Later he held a number of appointments in the mains department of the Birmingham undertaking, working largely in the east Birmingham and Solihull districts. Following the formation of the MEB in 1948, he was appointed district engineer at Solihull and in 1950 he was promoted to a similar appointment in Birmingham South East District, where he has been responsible for supplies to many important industrial consumers. Mr Worthing has held a number of appointments in the Electrical Power Engineers Association, including treasurer of the Midland Divisional Council and a member of the National Executive; he has also been vice-chairman of the District Joint Board and a member of the National Joint Board for the Electricity Supply Industry.

Following the acquisition of all the Nalder Bros. and Thompson share capital by A. Reyrolle and Co. Ltd., it is announced that **Mr A. G. O'Neill,** chairman, and **Mr E. W. Semmens,** managing director, will continue in office, and that the constitution of the board of directors remains unchanged except for the co-option of **Mr J. Bennett** and **Mr W. Gray** as directors.

Mr F. A. Russell has this month taken up duties as London area sales manager of Gatehill Beco Ltd. He has previously served with Bylock Electric, Sunbeam Electric and Kenwood.

Mr H. C. H. Matthews, B.SC., A.M.I.E.E., has been appointed a technical director of Pantak Ltd.,

Among the new vice-presidents of the Federation of British Rubber and Allied Manufacturers is **Mr D. D. Marshall,** managing director of the Greengate and Irwell Rubber Co. Ltd.

Mr R. H. Dean, a director of Parmiter, Hope and Sugden Ltd., is in Canada on a fact-finding tour.

Mr Geoffrey Lockwood, joint area director in the Midlands, has recently left the Edmundson group. **Mr H. E. Bagnall,** previously joint area director with Mr Lockwood, now assumes sole local control of all Edmundsons' interests in the Midlands. Mr Lockwood started his career in the electrical trade and in 1947 became a director of Electro Mechanical Supplies Ltd. before that company was taken over by Edmundsons and its name changed to Edmundsons (Midlands) Ltd.

Dr W. J. Gibbs, D.SC., M.I.E.E., has relinquished his appointment as manager of the engineering mathematics department, Associated Electrical Industries (Rugby), and remains as a group company consultant. **Mr N. Kerruish,** M.A., A.M.I.E.E., is appointed to succeed Dr Gibbs as manager. Dr Gibbs joined the BTH Co.'s Test Department at Rugby in 1920 after graduating at Bristol University. He was transferred to the then AC Engineering Department as a design engineer in 1923 and worked in various sections of the department in turn. In 1951 he was appointed consulting engineer in mathematics and took charge of the Advanced Engineering Course. In 1958 he became the first manager of the newly formed Engineering Mathematics Department. Dr Gibbs was chairman of the IEE Rugby sub-centre in

Mr A. R. Enshaw

Mr M. F. Sillett

Mr F. A. Russell

1959-60 and a member of the Utilisation Committee, 1957-60. He has also been a visiting lecturer on the staff of Manchester University from 1958. Mr Kerruish, who was a wrangler in the Mathematical Tripos in 1947, joined the BTH Co. in 1948 and from then until his present appointment served as consultant mathematician and lecturer for the Advanced Engineering Course, first with Dr B. Adkins in the Plant Engineering Department, then with Dr W. J. Gibbs in the department of which he is now manager. Mr Kerruish is a member of the Electrical Engineering Advisory Committee of Loughborough College of Technology, of the committee of the Rugby IEE sub-centre, and of the Engineering Advisory Committee of the East Warwickshire College of Further Education.

Previously with Belling and Lee Ltd., **Mr J. E. Bailey** has joined Advance Components Ltd. as export manager.

Mr G. V. Cox has been appointed general manager of sales, plastics products, of Monsanto Chemicals Ltd., and **Mr M. W. Waugh,** general manager of sales, chemical products. Both general managers will report to the director of sales, Mr D. C. M. Salt. Mr Cox, who joined Monsanto in 1951, will be responsible for sales of polyethylene and styrene plastics. Mr Waugh, who joined the company in 1947, will be responsible for sales of fine, heavy and technical chemicals.

Mr J. Flood, ASSOCIATE I.E.E., **Mr E. E. Jacobi,** M.I.E.E., **Mr W. F. Parker,** M.I.E.E., and **Mr L. F. Parsons,** ASSOCIATE I.E.E., have all been appointed directors of Troughton and Young Ltd. They have been technical directors for the past 14 years.

OBITUARY

Mr H. V. Slade, O.B.E., J.P., chairman of the Garrard Engineering and Manufacturing Co. Ltd., died on 19 July, aged 72.

Mr W. Harpley, deputy general manager of English Electric's Preston works and the Saulesbury Flight Sheds, has died, aged 60.

Major V. C. M. Gonne, formerly of the CEB and the South Western Division of the CEGB, who participated as a wayleave officer in the early development of the grid system, has died. He retired about six months ago.

Mr P. Blunt, B.SC., M.I.E.E., sub-area engineer, No. 4 sub-area of the Merseyside and North Wales Electricity Board, died on 21 July, aged 49 (*ESH, page 139). He joined Manweb as deputy sub-area engineer in 1951, and was promoted to sub-area manager in 1954. Earlier he was with the Midlands Electricity Board, in the chief engineer's department. Prior to 1948 he served with the Wolverhampton Corporation undertaking, at Newport (Mon), the Mid-Lincs Electric Supply Co. and the Leicestershire and Warwickshire Electric Power Co.

Mr F. R. Jolley, formerly managing director of Simon Handling Engineers Ltd., died on 20 July.

Mr W. C. C. Turner, formerly of Crompton Parkinson Ltd., died on 23 July, aged 81. He started with Crompton and Co. at Chelmsford in 1898 and after completion of his apprenticeship he was appointed arc lamp specialist, a position which he held until the outbreak of the first World War. In 1918 he took charge of instrument sales combining the function of salesman and technical adviser, particularly to educational establishments, to whose interests he devoted the majority of his time prior to his retirement. After retiring in 1940 he continued to act in an advisory capacity.

Mr D. R. Williams, B.SC.(ENG.), M.I.E.E., M.I.MECH.E., F.INST.F., manager of No. 7 (Grimsby) sub-area of the Yorkshire Electricity Board, died on 21 July, aged 54 (*ESH, page 147). Prior to nationalisation of the industry, Mr Williams was borough electrical engineer and manager at Grimsby for two years, following a similar period as deputy chief engineer to the Stretford and District Electricity Board. He gained his early training in Switzerland, with Brown Boveri and Sulzer Bros. Returning to this country, he became commercial assistant to the S.W. and S. Electric Power Co., and from 1933 to 1939 served with the Powell Duffryn group. From 1939 to 1944 he was technical and construction engineer to the West Midland Joint Electricity Authority.

NEW LITERATURE

Heating & Ventilating Industry Year Book 1960/61

THE fourteenth issue of this trade journal, it includes all the usual information for the practising heating and ventilating engineer and, in addition, three contributed articles, "Design Problems of Radiant Heating," by A. A. Field; "The Thermal Behaviour of a Building," by A. C. Pallot; and "Boiler Water Treatment," by P. D. Dehnel. Published by Technitrade Journals Ltd., 506 pages, 8¼ in. by 5¼ in. Price 15s.

Electromagnetic Fields and Waves

by R. V. Langmuir

ANY textbook which bears Prof Langmuir's name is bound to be read with respect, and this volume on electromagnetic fields and waves is no exception. Designed primarily for relatively mature students at senior or first year graduate level in electrical engineering or applied physics, it commences with an introduction to electrostatics and proceeds rapidly to theories of magnetism, electromagnetic waves, waveguides and wave propagation in a form which has been dictated by the arrangement of courses the author has used at the California Institute of Technology. Without some tutorial guidance, however, the student will find it heavy going. Published by McGraw Hill, 227 pages, 9 in. by 5¼ in. Price 76s.

Electronic Maintainability, Vol 3

edited by F. L. Ankenbrandt

"NECESSITY, the recognised mother of invention, has given birth to a new darling . . . maintainability." So writes one of the 29 contributors to this compendium of papers presented on one aspect of electronic equipment technology at a conference held in San Antonio last year. The contents are unashamedly concerned with electronic equipment specially designed for the American defence programme; the objective being the development, to a high degree, of methods of automatic fault determination and location in complex equipment such as missile computers prior to launching. It is, obviously, useless to discover a fault only after the missile is in flight. In this respect the equipment differs from that for use in civil and military aircraft, where the usual procedure is to replace the unit in which the fault has developed only *after* failure has taken place. The importance of the philosophy and its impact on the future design of all electronic equipment, regardless of application, is obvious. While, therefore, the actual contents have only a limited interest at present, there is much to stimulate the forward thinking of all progressive electronic designers. Published by Chapman and Hall, 312 pages, 9 in. by 5¼ in. Price 80s.

Radio Receiver Servicing

by E. M. Squire

IN the third edition of this book, which was first published in 1940 and subsequently revised in 1946, the author gives particular attention to the current trend to use f.m. and transistorised receivers, and printed circuits. The text has also been revised to remove material now rendered obsolete by modern receiver design techniques. The first four chapters are concerned with a general survey of receiver types and their components, including printed circuits and transistors. Subsequently, the author outlines the operation of a.m., f.m., and transistorised receivers and the radiogramophone. The concluding chapters describe radio servicing equipment and its use. Published by Pitman, 172 pages, 7¼ in. by 5 in. Third edition, price 15s.

Inverse-time relays

BETTER MATCH WITH EQUIPMENT THERMAL RATING NEEDED

By J. L. Dineley, M.Sc.(Tech.), A.M.I.E.E.*

INVERSE time overcurrent relays are widely used on British power systems as well as abroad and are said to comprise more than 80% of all relays sold. They offer the simplest form of protection and, when associated with similar earth fault relays, are usually the main protection at the distribution voltages of 6·6 kV and 11 kV. At the higher voltages, where more complicated forms of protection are justifiable, they are still retained but are relegated to the duties of back-up and overload protection. The relays are invariably based on the induction disc motor, giving an inverse time/current characteristic which is usually of a standard form agreed nearly 40 years ago and now defined in a British Standard Specification.[1] Recent developments seem to have been concentrated on such aspects as mounting, overswing, contact arrangements and indicating flag operation.

Back-up and Overload Protection

The separate intentions of "back-up" and "overload" protection are not always clearly distinguished, and it is the author's contention that, in so far as overload relaying is concerned, insufficient attention has been paid to the advantages of matching the relay characteristic curve to the safe current-time thermal characteristic of the equipment protected.

Back-up protection is usually by means of overcurrent (and earth-fault) inverse-time relays and is only meant to operate in the event of defect of the main protection or in the event of failure to trip on some electrically adjacent apparatus. If the circuit-breaker cannot clear a fault, or if the main protective gear fails, then the back-up protection should operate, perhaps on a circuit-breaker further back in the system. The considerations in choosing the relay setting are usually similar to those employed with overcurrent relays used as main protection on the lower voltage distribution systems mentioned above; i.e., time-graded discrimination is applied so as to minimise "outage" in the event of clearing a fault on back-up protection.

On fully interconnected systems, complete discrimination is impracticable, but often it is still possible to decide where faults are most likely to occur, and to arrange for the tripping to be quickest there. An example is where these relays are arranged to afford a degree of busbar protection if there is no specific protection for this purpose. On some systems it may be possible to arrange for the system to be split up by the back-up relays when extensive tripping may occur, so as to minimise the extent of the outage, on the principle that it may be better to prejudice the safety of part of the system more often rather than shut down the whole on occasion. The time-grading is thus on the basis of potential fault currents, and the principles involved are exactly the same as those adopted on the lower voltage systems. These have been established for a number of years[2] and by using them the most suitable relay settings for back-up protection can be chosen if every possible fault, and its likelihood of occurrence, is considered.

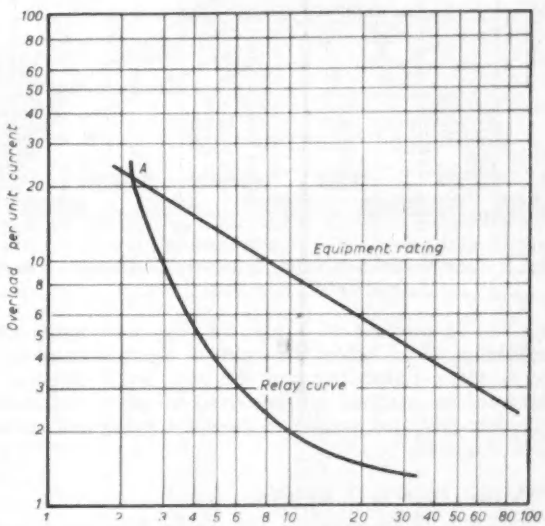


Fig. 1. Time/current characteristic for typical oil-filled transformer on overload compared with normal inverse-time relay characteristic

Overload protection may be planned with the overcurrent relays, or may only be incidentally obtained with the fault settings. As the fastest operating time should occur at the point of lowest potential fault current, and the slowest operating time at the point of highest potential fault current, it is evident that fault considerations and not overload will dictate the relay settings.

Where specifically desired, overload protection is normally arranged by using the same form of overcurrent relays, which have a basic definite minimum operating time of 2·2 sec at 20 times setting current, 3 sec at 10 times setting, and operate in 30 sec at 1·3 times setting. Fig. 1 shows the time/current characteristics of a typical oil-filled power transformer or reactor on overload. The short-circuit characteristics may differ from this curve because considerations of internal bracing rather than thermal capacity then predominate, hence the curve does not extend beyond 25 p.u. current. The curve does not extend below 2·4 p.u. current because below this it becomes asymptotic to 1·0 p.u. current, at a time which is dependent upon the physical size of the equipment and the ambient temperature. This graph also indicates the time/current characteristics of the relay already described, with the longest possible time setting. It will be seen that the equipment is not protected at all against heavy overloads, as a current of 20 p.u. or more cannot be disconnected in less than 2·2 sec plus the circuit-breaker time (Point A on Fig. 1). As the overload decreases, the relay is seen to disconnect the apparatus long before this is necessary;

* Mr Dineley is Lecturer in Electrical Power, King's College, University of Durham.

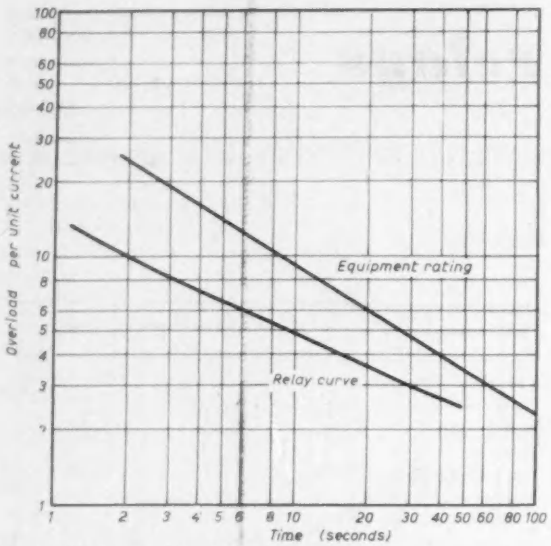


Fig. 2. Time/current characteristic of oil-filled transformer compared with that of "more inverse" relay

e.g., at an overload of 3 p.u. the relay disconnects the apparatus 58 sec before the overload becomes dangerous to it. On a system overload this may prove disastrous, because the overload is transferred to other equipment similarly protected, leading to cascade tripping and extensive shutdown.

"More Inverse" Relays

The logical conclusion to be drawn from these considerations is that an overload relay is not appropriate to its duties unless its time/current characteristic curve corresponds to that of the equipment protected. In the author's opinion, this is a point of view to which insufficient attention has hitherto been paid. Neglecting the ambient temperature effects which operate at small overloads, the time for which the current can be safely carried is inversely proportional to the square of the p.u. current; i.e., the apparatus has a basic time/current relationship of $I^2t=K$. The relay characteristics may be demonstrated by an exercise in curve fitting to correspond to the law

$$3{\cdot}25\ It-I^2t-2{\cdot}4\ t=K$$

This is because the relay motor iron circuit is deliberately arranged to begin to saturate at more than about 2 p.u. current, so as to obtain the definite minimum operating time which is necessary for time-graded overcurrent protection.

If the relay had a "more inverse" characteristic; i.e., if its curve approximated to the law $I^2t=K$, then K could be adjusted by means of the relay current setting to suit the particular apparatus protected. Some measure of time-grading could still be incorporated, if desired, by means of the time multiplier setting of the relay. Fig. 2 again shows the time/current characteristic curve of the transformer or reactor, this time compared with that of a typical more inverse relay characteristic. By operating much more closely to the full thermal rating of the equipment, this relay is seen to give much-improved overload protection and to enable much more of the overload rating of the equipment to be used. The relay clearly has a preferable form of characteristic; for example, at an overload corresponding to 3 p.u. current there is a gain of 25 sec for the emergency to be dealt with, compared with the conventional relay shown on Fig. 1. Corresponding time gains could be made at each consequent tripping should cascading occur, offering more chance of preventing an extensive shutdown.

These "more inverse" overcurrent relays are already recognised as essential for the negative phase sequence protection of alternators, and it is the author's submission that they are justifiable as overload relays on important equipment.

REFERENCES

1. British Standard Specification 142 (1953): "Electrical Protective Relays."
2. Gallop, J. W., and Bousfield, R. H.: "Application and Limitations of the Inverse-Time Relay to the Protection of an 11 kV System," *J.I.E.E.*, Vol. 87, 1940, pp. 199-34.

Famous Nash Terrace Converted to Flats

THOUGH there may be conflicting opinions on Nash as an architect, the dignity and spaciousness of his terrace houses in London and Bath are such that it would be a thousand pities were they allowed to vanish. Yet such is the condition of them through neglect, war damage and inadequacy of the original materials that the danger remains a real one. Fortunately, one of the finest examples, Cumberland Terr, Regent's Pk, has just been converted by the Crown Commissioners into modern service flats, at some £¾ million expense, and so has been saved for the next century looking externally almost as Nash originally planned them.

Internal woodwork has had to be removed and replaced by concrete and steel, and the architect, Mr K. Peacock, has utilised an entirely new and separate structure within the original walls, only loosely tied to them, while completely refacing the exterior. Moreover, though the terrace now accommodates 44 flats, ranging from two rooms, kitchen and bathroom, to seven rooms, kitchen and two bathrooms, the former-day proportions have been retained in all but the smallest of the back rooms.

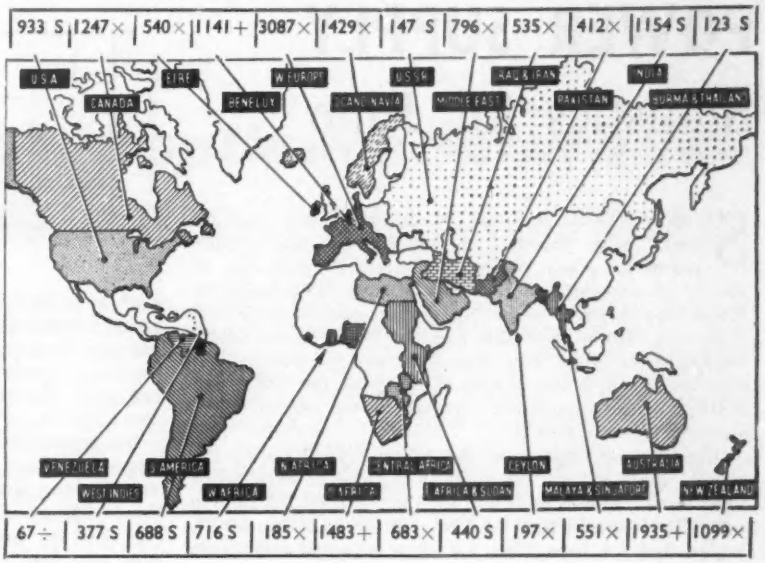
As befits a modern flat, they are all-electric, excepting only for a gas point in the kitchens. Under-floor heating, on the "Panelec" system, with individual thermostats in each room, replaces central heating; the running costs for which are included in the service charges. Each room has its own ring-main with a minimum of three pairs of 13 A sockets, plus ceiling lighting points and a separate 13 A point at the back of the fireplaces in the main rooms. Kitchens have power points for cooker, refrigerator and kettle, and additional points for other appliances. The bathrooms, the only rooms without natural lighting, have heated towel rails, immersion water heater for bath and basin, razor point and an additional heater/ventilating fan in the roof, since under-floor heating is not extended here. The electrical consultants, Peter May and Partners, specified m.i.c.c. wiring and have been responsible for the high standards of installation throughout.

In the basement an all-electric laundrette, installed for the use of tenants, includes a Hoover and a Bendix washing machine, English Electric tumbler dryer and a rotary ironer. Water for washing is supplied from a 9 kW boiler, of which 6 kW is used as a boosting load only when washing is in progress and the water temperature has fallen. Small flats for servants, over the garages at the rear, are also all-electric.

John Nash, the visionary, would, we feel, have approved of the way his design has been modified to present-day conditions, though he might have been shocked at the rents, ranging from £305 to £1,290/annum, including service charges but not rates, plus considerations for 30-year leases, ranging from £4,000 to £16,250. Nevertheless, they have all been taken, a fact which should encourage similar conversions elsewhere.

Distribution of Exports in £'000's Sterling

×=over 25% increase
+=10% to 25% increase
S=10%+ to 10%−
−=10% to 25% decrease
÷=over 25% decrease
on previous year's figures



EXPORTS IMPORTS

June

OVER £1 million up in value on the previous month, electrical exports during June again topped the £25 million mark for the third time this year, although the total is still over £1½ million down on the year's best—for January.

The grand total of exports of goods listed in our table for the first six months of 1961 is £152,114,327, compared with £134,350,998 for the same period of 1960—a reasonable increase.

Only a small proportion of last month's increase concerned the heavy plant side of the industry, with electric motors (apart from f.h.p. size) contributing. Exports of both lamps of various types and lighting fittings provided a further rise, along with better domestic appliance business. Among the latter, the chief contributors to the increase were cookers, water heaters, floor polishers and washing machines.

The cable industry, too, chalked up a small increase which was spread over most types.

Australia was our best customer of the month with a total of over £1·9 million of which £226,833 related to generators and motors, £507,728 to converters, rectifiers, transformers and switchgear, and £72,387 for cables.

Total value of imports for June were also over £6 million for the second time this year, and bring the total value for the first six months of 1961 to £33,036,090, nearly £2 million up on the corresponding period of 1960.

Description	Exports Value (£)		Imports Value (£)	
	June 1960	June 1961	June 1960	June 1961
Generators	323,959	361,473		
Diesel up to 200 kW	260,828	298,166		
Diesel over 200 kW	164,850	29,101		
Steam turbine driven	193,469	662,480	81,091	146,855
Water and gas turbines	47,684	155,419		
With i.c. and other prime movers	50,250	118,610		
Generators up to 200 kW	75,906	86,829		
Generators over 200 kW	742,941	657,688		
Generator parts	254,050	269,149		
Motors, f.h.p.	383,482	499,994	189,864	262,352
Motors 1-250 h.p.	212,683	422,463		
Other motors	254,619	357,677		
Motor starters and controllers	138,465	81,085	157,016	135,488
Converters and rectifiers	587,764	798,640		
Transformers	503,686	500,190	112,071	169,725
Switchgear, to 200 A, mv	953,772	1,230,676		
Switchgear, other	*5,138,408*	*6,529,640*	*540,042*	*714,420*
Total, Electrical Plant				
Batteries, primary and parts	562,127	649,742		
Lamps, filament, over 28 V	89,390	120,334		
Lamps, filament, under 28 V	26,121	22,991	100,627	136,188
Fluorescent tubular lamps	69,096	101,136		
Other lamps and parts	71,169	90,166		
Radio and electronic gear	3,742,339	4,609,258	1,319,634	1,646,741
Telephone and telegraphic equipment	1,583,721	1,897,415	39,793	88,157
Cookers	30,517	34,547		
Other cooking appliances and parts	139,967	166,594		
Space heaters	11,025	19,264	143,680	243,103
Water heaters	24,619	42,135		
Other heaters and parts	103,783	171,088		
Electric irons	71,942	78,040		
Vacuum cleaners	103,673	256,263		
Floor polishers	52,887	62,508	124,486	206,321
Food mixers	65,233	73,674		
Washing machines, up to 150 lb	403,863	745,827	90,696	92,083
Dryers	45,231	19,772		
Washing machine and dryer parts	184,636	207,644		
Domestic refrigerators and parts	730,720	660,935	670,341	178,669
Other appliances and parts	335,827	300,926	47,681	52,191
Total, Domestic Appliances	*2,303,923*	*2,839,217*	*1,076,890*	*772,367*
Portable power tools	243,904	351,675		
Arc welding plant	98,909	77,554	71,697	101,320
Resistance welding plant	51,416	102,633		
Electric furnaces	62,848	103,934		
Signalling apparatus	135,159	187,480		
Commercial instruments	185,702	178,396	98,307	157,648
House service meters	131,862	187,129		
Wiring accessories	210,902	246,464		
Fans	132,892	159,949		
Lighting fittings and lanterns	344,380	357,383	130,780	216,878
Other lighting equipment	87,416	105,298		
Telephone and telegraph cable	348,408	451,328		
Paper insulated cables	454,450	423,405		
Rubber insulated cables	251,938	255,528		
Thermoplastic insulated cables	255,643	393,085		
Winding and similar wires	118,284	217,087		
Other cables and wires	186,462	209,773		
Total, all cables and wires	*1,615,185*	*1,950,206*		
Accumulators and parts	277,922	383,612		
Insulating materials	168,293	230,898		
Industrial electronic control gear	197,933	186,103	31,253	140,749
Electrical ware	99,839	154,282		
Permanent magnets	57,058	55,582		
All other articles	2,374,995	3,602,817	1,625,845	2,061,679
Total	20,090,009	25,481,294	5,034,868	6,036,047

POWER SUPPLY
Statistics for June

SUBSTANTIAL increases in electricity sent out by most area boards, particularly in the mainly industrial areas where the increases were up to 16·8%, are reported for the month of June. Only the South Wales and Eastern boards show increased sales of less than 10%. Both the SSEB and the NSHEB also show marked sales gains over June last year of about 17% and, for the first six months of the year, the SSEB and NSHEB record cumulative increases in units sold of 11·2% and 10·3%, respectively.

The total electricity sent out by the CEGB during the month was 7,632 million units, with corresponding SSEB total of 473 million units and for the NSHEB, 161 million units. The national total of 8,266 million units was 13·2% higher than for June, 1960, but when the usual corrections are made for weather conditions and number of working days, this percentage reduces to 7·7%. In the first six months of the year, thermal generation was 7·3% more than in the same period in 1960 and hydro generation rose by 9·6%.

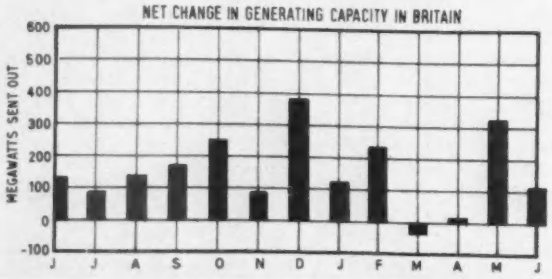
Only one set was commissioned during June. This was the No. 6 set at Belvedere (L) „h.p. station rated 120 MW and manufactured by English Electric. The unit boiler, rated 860 klb/hr, was built by John Brown. Commissioning of this unit completes the new plant programme at Belvedere. Output capacity of the two Scott'sh boards remained unchanged in June, but the CEGB output capacity rose by 115 MW to 27,530 MW, giving a total for Great Britain of 30,323 MW or 7% higher than in June last year. Electricity generated by the three boards was also 13·2% more than in June, 1960, at 8,812 million units.

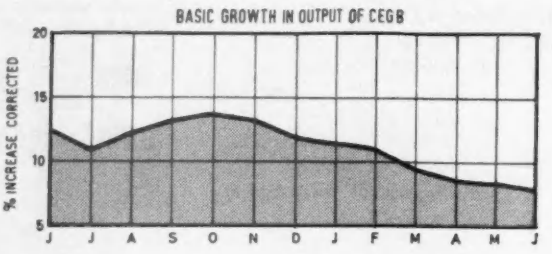
Oil consumption by the three boards was the lowest since September, 1959, at 346,000 tons and 9·7% less than in June last year. In contrast, coal consumption rose by 17·2% to 3,786,000 tons, of which 3,522,000 tons was used by the CEGB. Coke and breeze consumption also rose by 14·4%, although at 68,000 tons that fuel forms a relatively small proportion of total fuel requirements. For the first six months of the year, coal consumption has increased by 7·3% over the corresponding total for the same period in 1960, and oil used has risen by 6·9%. Since the beginning of the year, when they fell to 5,200,000 tons, coal stocks at power stations have risen steadily and at the end of June were 6,900,000 tons, 20% higher than in June last year.

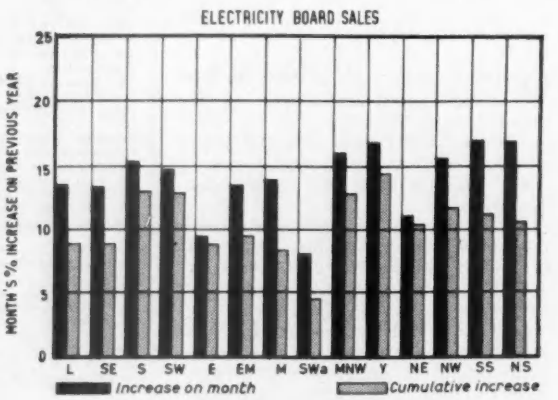
Electricity Board Sales Progress in June

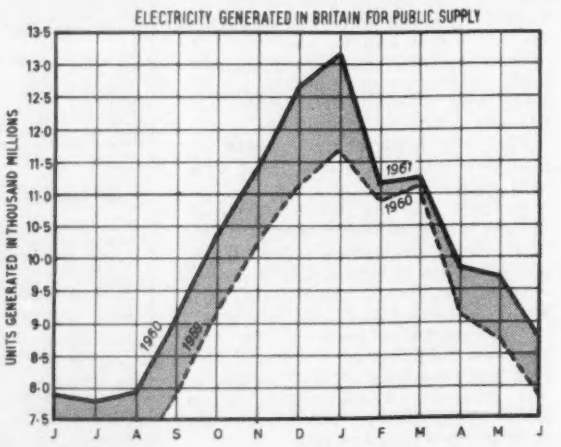
Board	Electricity sent out in millions of units	% Increase June 1960
London	570·7	13·4
South Eastern	441·5	13·4
Southern	602·1	15·3
South Western	284·1	14·8
Eastern	699·5	9·5
East Midlands	627·3	13·5
Midlands	811·0	13·8
South Wales	485·2	8·2
Merseyside and N. Wales	529·8	16·1
Yorkshire	861·9	16·8
North Eastern	470·2	11·1
North Western	825·4	15·6
Direct Supplies by CEGB	314·9	5·4
CEGB Total	7,523·6	13·2
South of Scotland	607·1	17·0
North of Scotland	131·6	16·9

Table excludes area board purchases from other sources.









Towards Appliance Saturation

SOCIAL TRENDS IN APPLIANCES SHOWN IN THIRD SURVEY

INFORMATION on the saturation figures for electrical appliances is always welcome and the industry owes a debt to the Research Division of Odhams Press Ltd. for the surveys they have presented in connection with their journal *Woman*. Figures for the third national survey have now been published and are reproduced below by courtesy. They provide an evaluation of the position in January to March this year which can be compared with corresponding results for surveys in 1958 and 1956.

The general saturation figures given in Table 1 show advances nearly all along the line, with refrigerators, steam irons and washing machines having made the most progress. Only dry electric irons and wash boilers show a decline, due to the increasing popularity of the steam iron and the washer.

These surveys provide also a breakdown of the statistics to show social influences on the use of appliances. In general the highest saturation factors occur where housewives are between the ages of 35 and 44 but, as would be expected, it is below that age that the greatest number of acquisitions have been made in the last five years. By social class, it is the AB group that generally shows the best percentage figures under all headings.

The breakdown of the statistics between urban and rural areas discloses some marked differences. On a sample one-quarter the size of that of urban dwellers, the saturation figure for cookers, not surprisingly, is double for rural areas, 41·2%, against 19·5%. Higher saturation is also shown in rural areas for toasters, kettles, wash boilers, mixers and water heaters. Analysis by size of family shows almost invariably, that much the better customer is the family with children, and of these the family of three or four shows the highest figures.

Study of the saturation figures in relation to the number of years married leads to few detailed conclusions but they do tend to emphasise the substantial number of appliances that are purchased within the first five years of married life. Indeed the highest saturation figures are shown in this group for dryers and toasters, and less surprisingly, steam irons. An even more diverse picture is shown of the geographical distribution of saturation factors.

Table 1. Appliance Saturation Factors and Recent Purchases

Appliance	Appliance saturation			Obtained in last five years		
	1961	1958	1956	1961	1958	1956
Cooker	24·2	22·0	22·6	11·8	9·4	11·5
Spin/Tumble dryer	5·1	—	—	4·9	—	—
Washer	39·4	28·4	19·0	23·3	16·6	12·5
Refrigerator	19·7	10·2	7·2	13·6	5·3	3·8
Wash boiler	6·3	8·8	11·3	3·1	3·7	5·3
Steam iron	17·5	12·1	5·0	11·7	10·5	4·4
Iron	80·9	83·0	83·4	22·5	25·1	33·1
Toaster	11·7	12·2	9·7	4·1	3·9	4·0
Kettle	32·2	30·3	27·1	12·8	11·3	12·7
Food mixer	3·0	2·1	0·7	1·9	1·4	0·5
Vacuum cleaner	71·1	64·9	50·6	28·4	27·9	23·1
Immersion heater	25·5	23·5	15·4	12·0	11·6	8·5
Water heater	5·5	3·9	4·9	3·0	1·8	2·7
Hair dryer	24·3	20·4	9·9	11·9	13·3	6·8
Fire/heater	63·6	61·6	56·5	26·7	20·3	18·2
Base for percentages	4,144	4,163	3,992	4,144	4,160	3,992

Scotland is distinguished as having the highest saturation of cookers and the north-east of washing machines. London and the south-east leads on refrigerators and fires and the north-west in cleaners, mixers and immersion heaters.

One of the particularly useful sets of figures given is the year-by-year breakdown of appliances purchased in the last five years, and figures for some of the more important categories are shown in Table 2. This indicates that 1960 was the best year for cookers, refrigerators, kettles, fires, immersion and water heaters, with washers and dryers leading in 1959.

Brand Leadership

One of the interesting, though perhaps less useful, sections of these surveys is the analysis of the appliances obtained in the last five years under respective makes. It should be mentioned that the samples taken in respect of individual appliances have a range of ten to one.

In cookers, Belling are shown as having increased their lead over other makes. Simplex, in second place also show an increase but most other makes have declined except that Tricity has jumped from seventh to fifth place. Hoover's still dominate the washing machine market although their proportion has fallen partly due to increased competition from Hotpoint and to a larger number of makes on the market. Figures for spin and tumbler dryers are included for the first time and show the Creda Debonair with 32% of the market.

The refrigerator market also reflects the number of new entrants. The leaders, Electrolux have lost by half their 1956 share of the market and Prestcold have also lost ground. Frigidaire, however, have increased their share by three times. Little variation appears to have taken place in the popularity of makes of vacuum cleaners over the five years with Hoover retaining over 40% of sales.

Among the smaller appliances it is significant how certain brands maintain their domination of the market. From 45% to over 70% of sales are recorded for wash boilers (Burco); irons (Morphy-Richards); steam irons (Hoovers); toasters (Morphy-Richards); kettles (Swan); and hair dryers (Morphy-Richards). On fires and heaters, Belling have increased their lead up to 24% of the market and Sadia have lost only slight ground in water heaters in the face of Creda expansion.

Table 2. Appliances obtained in last five years

Year obtained	Cooker	Washer	Spin/Tumble dryer	Refrigerator	Vac. cleaner	Fire/heater	Immersion heater
To 1 year	23·6	22·1	25·4	26·5	16·9	33·6	27·3
1/2 years	18·2	24·3	29·3	25·2	20·8	17·5	18·5
2/3 years	19·3	24·0	28·4	22·9	22·8	19·0	17·6
3/4 years	23·1	17·5	11·4	16·2	22·4	18·8	18·6
4/5 years	15·8	12·1	5·5	9·2	17·1	11·1	18·0
Base for percentages	488	966	201	563	1,173	1,108	491

new products and appliances

Anti-vibration nylon lock-washer

TO prevent nuts and bolts from working loose under severe vibration conditions, a nylon lock-washer has been developed. Known as a "Dubo" ring, its action is achieved principally by the cold flow of the nylon when the nut is tightened. The material is squeezed into the interstices of the mating screw threads causing them to grip; at the same time the sides of the washer are caused to well-up, producing a tab-washer effect. In addition, there is straightforward frictional effect between nut, washer and bearing surface interfaces. *Fan Disc Ltd., 109 Northwood St, Birmingham 3.*

Shock-proof masonry plug

A NEW type of plug for providing a firm masonry anchor consists of an internally threaded and tapered brass cylinder containing a core of lead. Having placed the plug into a hole of suitable size drilled in the masonry, an anchor-bolt is screwed into the brass cylinder with a ball of nylon interposed between the end of the bolt and the lead core. The screwing action deforms the core, squeezing the lead to expand the end taper of the brass cylinder. The nylon ball acts as a buffer to absorb shock and vibration. Of Swiss origin, the plug has the advantage of being rust-proof. Designated the "OBO K-Plug," sizes are available to accommodate bolts of diameter $\frac{3}{16}$ in., $\frac{1}{4}$ in. and $\frac{5}{16}$ in. The latter size is claimed to withstand pull-out forces up to 3,000 lb in magnitude. *Douglas Kane Ltd., 243 Upper St, N.1.*

Central heating 30 A relay

DESIGNED originally for domestic central heating installations and said to comply with area board requirements, a 30 A relay is now available for motor control, soil heating and similar industrial applications, as well as domestic installations. The relay has a single contact, rated 30 A, and it is suitable for operation on a.c. or d.c. 230 V circuits. Single relays are 4 in. by 2 in. square and can be supplied unhoused or enclosed in a tamper-proof transparent cover. A feature of the relay is that, except for the initial closing click, it is silent in operation. They can also be supplied mounted compactly in pairs for control of twin circuits. *The Keyswitch Co., Irongate Wharf Rd, Praed St, W.2.*

Process control monitoring indicators

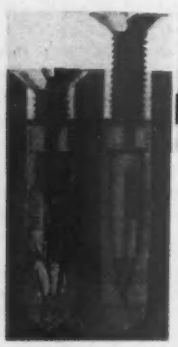
FOR use in conjunction with Satchwell "Duotronic" control systems, a range of indicating units have recently been introduced. Known as the "Vistonic" range, these instruments incorporate high-grade moving-coil movements with shock-proof jewelled mountings. The scales are designed to give clear, shadow-free readings indicating plant or process conditions. A variety of types are available to suit different control systems. Typical example of a basic unit is a temperature indicator which gives a continuous reading of both "pre-set" and "actual" temperatures. *Kingston Control Systems Ltd, Empire Chambers, Clarence St, Kingston upon Thames.*

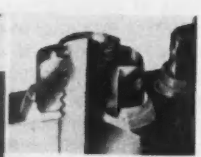
"No scaling" claim for instantaneous water heater

PROVIDING an instantaneous supply of hot water at up to 149°F, the imported "Eldur" water heater incorporates a heating element designed to eliminate scale deposition in hard-water areas. Water is arranged to flow directly over the heating element ensuring a heat transfer efficiency of almost 100%, it is claimed. Models in the range are available rated from 2·5 kW, single-phase—for domestic use—right up to 24 kW, three-phase, for hotels and similar establishments. Compact in size, these units are said to give long periods of service without maintenance. If necessary, heating elements are easily replaceable at the cost of a few shillings. These units operate on water pressure and can be installed in under an hour. The "Eldur" is not suitable for d.c. supplies. *European Imports and Exports Co., 2-5 Manor St, Bridlington, Yorks.*

Simple corrosion measurement

FOR those responsible for protection of plant or equipment against effects of corrosion, or engaged in research on the subject, the recently imported "Corrosometer" should prove a valuable aid. Manufactured by the Crest Instrument Co., of the USA, the instrument determines progress of corrosion of a metal sample by measuring change in electrical resistance as the cross-section of the specimen is reduced by corrosive effects. Resistance is compared with that of a check specimen for which corrosion is inhibited by a suitable protective coating. Readings can be carried out in less than a minute, it is claimed, and the instrument incorporates a direct-reading meter calibrated in micro-inches of penetration. A range of test specimens is available, both coated and uncoated, in various commercial alloys and in forms such as wire, tube and strip. Shape and protective coating of standard test specimens depend upon the corrosive media involved in any particular investigation. The equipment is housed in a lightweight aluminium case and can be supplied for either mains or battery operation. *Winston Electronics Ltd., Shepperton, Middx.*





"Dubo," a nylon washer to prevent nuts working loose

Providing firmer anchorage in masonry, the "OBO K-Plug" can withstand pull-out forces up to 3,000 lb

Designed to give shadow-free readings is the "Vistonic" range of process control monitoring indicators

Said to be silent is the Keyswitch 30 A relay contactor

For either mains or battery operation the Winston "Corrosometer" is used to measure metal corrosion

Above: GEC's connectors for computers are easily assembled. Left: A new bimetal connector from AWCO

Improved bimetal connector

IMPROVEMENTS in design leading to a 15% price reduction over the original version are claimed for a new bimetal connector. Intended for "full current" teeing-off of copper from aluminium conductors, the collet of the connector is now made of tellurium copper and is secured to the bolted-type die-cast aluminium body by means of a compression joint. Separation of the two dissimilar metals is effected by means of the usual neoprene washer. The body will accommodate aluminium conductors in the diameter range 0·23 in. to 0·80 in. and the collet is suitable for copper conductors up to 0·72 in. *Aluminium Wire and Cable Co. Ltd., 2 St. James's Sq, S.W.1.*

Easily assembled connectors

SIMPLICITY and speed of assembly are advantages claimed for recently introduced connectors suitable for computers, telephone distribution boards and similar equipment. Individual connectors comprise a plated brass terminal housed in a specially shaped porcelain block designed to fit a galvanised-steel channel. Any number of connectors can thus be assembled alongside one another in the channel, according to requirements. Removal of a particular connector in an assembly can be effected by slackening a retaining clamp, sliding aside adjacent connectors and lifting clear the selected unit after turning it through 45°. Having a voltage rating of 660 V, the porcelain body of each connector is said to be non-tracking and suitable for use in humid atmospheres. A single block size is used for the three current ratings available, the latter being 40 A, 30 A and a light current rating for telephone equipment. *The General Electric Co. Ltd., Installation Equipment Group, Four Ashes, Wolverhampton.*

Magnets assist meter contacts

AN objection to meter-operated overload or safety cut-out relays has been their inherent unreliability due to weakness of initial contact pressure in breaking up surface oxide films. The recently announced "MagTrak" relay overcomes this difficulty by using a device to increase initial contact pressure. It consists of a soft-iron bead attached to the moving pointer of the meter, with a corresponding permanent magnet fixed to the adjustable index pointer. The index and moving pointers carry flexible contacts, forming part of the relay initiating circuit. As soon as the moving pointer reaches the position of the index pointer, the contacts are snapped together by the attractive force of the magnet and soft-iron keeper. In addition to the permanent magnet force, supplementary pressure is exerted by an electromagnet connected in series with the relay circuit. To reset the meter the relay circuit is broken by means of an external switch and the spring-loaded contacts fly apart against the action of the permanent magnet. *Daystrom Ltd., Bristol Rd, Gloucester.*

Double-gun c.r.t. for oscilloscopes

EXTENDING an existing range of double-gun helical p.d.a. cathode ray tubes, a 5 in. dia version, the "Type 1300 F," has been introduced for general purpose oscilloscope applications. Advantage claimed for the design is that it gives increased sensitivity and brightness compared with tubes not incorporating p.d.a. Having a final anode voltage of 4 kV, the tube has "X" and "Y" deflection sensitivities of 20 V/cm and 12·5 V/cm, respectively. Line width is approximately 0·5 mm and the tube has side pin connections to reduce input capacitance. *The M-O Valve Co. Ltd., Brook Green, W.6.*

Price variations . . .

THE price of Colston's fully automatic dishwasher has been increased to 95 gn from last Saturday. The increase is attributed to higher wages and raw material costs.

Stella Radio and Television have decontrolled the price of their Ada "Slendaline" refrigerator.

. . . and new colours

Chilton Electric's Mk IV shaver sockets are now available in ivory as well as standard grey.

Addition to the Hotpoint 'fridge line this week is the F40B in the Iced Diamond range. It now has a white interior with blue accessories, whereas its counterpart, F 40, has a pink liner. Prices of both models are the same, 64 gn with table top, and 61 gn without.

Charles Colston Ltd., High Wycombe, Bucks.

Stella Radio and Television Ltd., Shaftesbury Ave, W.C.2.

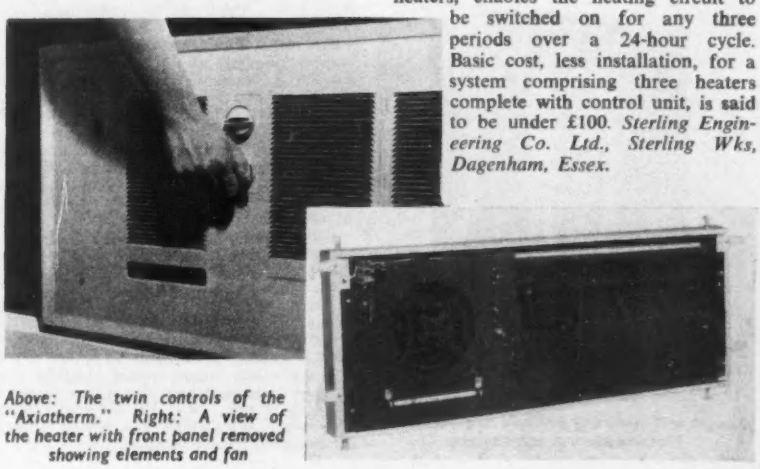
Chilton Electric Products Ltd., Hungerford, Berks.

AEI-Hotpoint Ltd., Grosvenor Pl, S.W.1.

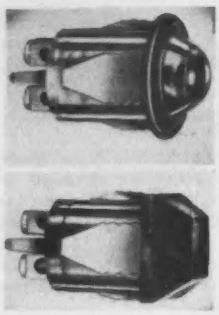
Economic electric house heating

LOW capital cost is a sales feature emphasised for electric "whole house" heating of which the "Axiatherm" system is one of the latest examples. In addition, economy in running costs is claimed by the use of combined time-switch and thermostatic control. The system, which is designed primarily for installation in new premises, consists of a number of built-in type, black-element fan-heater units controlled by a central time-switch. Thus, the heaters can be switched on automatically for predetermined periods chosen by the householder to suit his particular needs. He also has local overriding control over individual fan-heater output which can be adjusted to the full rated 3 kW or to 1½ kW at reduced fan speed. During the selected heating periods, required room temperature is maintained by adjustable thermostats fitted to each fan heater. If required, fans may be run with heaters switched off, providing circulating air during summer months.

Designed for flush fitting, each "Axiatherm" fan-heating unit has front facia dimensions of approximately 37 in. by 17 in. with a depth of only 2⅛ in. It can be conveniently fitted into a wall cavity, left for the purpose during building construction; the body of the unit incorporates four set-screws at its corners to ensure secure fixing. The standard control unit, which serves up to five heaters, enables the heating circuit to be switched on for any three periods over a 24-hour cycle. Basic cost, less installation, for a system comprising three heaters complete with control unit, is said to be under £100. *Sterling Engineering Co. Ltd., Sterling Wks, Dagenham, Essex.*



Above: The twin controls of the "Axiatherm." Right: A view of the heater with front panel removed showing elements and fan



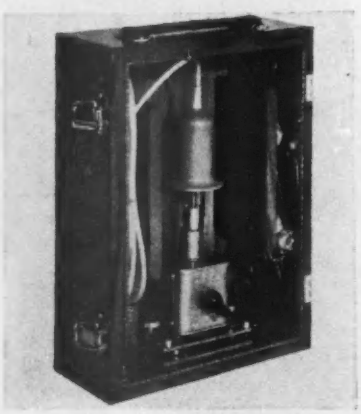
These two signal lamps from Thorn are retained by spring action and designed for a 0·629 in. dia hole

Spring-retained signal lamps

EASE of installation is the advantage claimed for a new range of Thorn signal lamps retained by spring action and designed to fit a 0·629 in. dia hole. Each device is made up as an integral neon or incandescent lamp unit and is intended to be discarded when its useful life has expired. Typical life expectancy quoted for the incandescent version is 5,000 hr. Three types are available for various working temperature ranges. The type "SGF 1717," for wide temperature extremes up to a maximum of 135°C, is particularly suitable for domestic cooking appliances and industrial heating plant. It is available in a wide range of colours, with incandescent versions suitable for 110 V, 220 V and 380 V operation. A second type, suitable for slightly lower maximum temperatures, can be supplied for five low voltages ranging from 4 V to 48 V. The third "SGF 16" type, is available in the neon version only, suitable for a maximum working temperature of 70°C. *Thorn Electrical Industries Ltd., Thorn Hse, Upper St. Martin's La, W.C.2.*

Lightweight pulse-measuring potentiometer

AFFORDING advantages of lightness and compactness, a recently introduced high-voltage pulse-measuring potentiometer features a vacuum capacitor internally shielded against stray capacitance effects, as compared with externally shielded oil-filled capacitors used in conventional equipment of this type. Designated the "PD 30," the instrument provides four measurement ranges and can handle voltage pulses up to 30 kV. The ranges comprise two preset voltage division ratios of 250:1 and 500:1 and differentation ratios of 7·5 kV/microsec/V and 5 kV/microsec/V. Total load capacitance of the device is 6 pF. The instrument is available either for building into ancillary equipment or with portable wooden case; it is supplied complete with connecting leads for high-voltage input and for output to measuring oscilloscope. *Ferranti Ltd., Hollinwood, Lancs.*



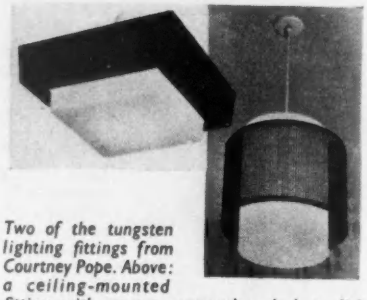
For use as a built-in or portable unit, Ferranti's pulse-measuring potentiometer

Glassware tungsten lighting fittings

RECENT tungsten lighting fittings by Courtney Pope make attractive additions to their existing glassware range. One is a pendant type, with an opal glass diffuser with a square mesh surround. Designated "TI.26," this elegant fitting is designed for use with a 150 W lamp. The other fitting, "TA.68," is for ceiling mounting and features a square surround housing a drop dish translucent diffuser. *Courtney Pope (Electrical) Ltd., Amhurst Park Wks, N.15.*

Multi-spiral fishwire for cable pulling

ADVANTAGE claimed for a new type of fishwire for pulling cables through conduit is that, unlike normal single spiral or flexible rod types, it will not suffer permanent distortion, either by excessive longitudinal tension or in passing through sharp conduit bends. Known as "Eflex" fishwire, it is made up of a number of prestressed spirals of piano wire wound one upon the other in an alternately clockwise and anti-clockwise sense. Lengths are supplied with lug terminations for connecting to the cable end and a pulling handle. Of Austrian origin, this installation aid is said to be in extensive use in continental countries. *Dr Heinz Zoebl, Wien 3, Haupstrasse, Austria.*



Two of the tungsten lighting fittings from Courtney Pope. Above: a ceiling-mounted fitting with square surround and drop dish diffuser. Right: A pendant fitting with an opal glass diffuser and circular mesh surround

Resistance wire dearer

FOLLOWING recent increases in the price of nickel alloy, British Driver-Harris have raised the price of their nickel alloy resistance wire. The changes, which take effect from 4 Sept. this year, affect "Nichrome," "Nichrome V," "Chromax," and "Advance." Amended surcharges range from 2s/lb to 3s 9d/lb for these products. *British Driver-Harris Ltd., Cheadle Heath, Stockport.*

TRADE PUBLICATIONS

CASTROL INDUSTRIAL.—New edition of *Transformer and Switch Oils*, is a 42-page guide for electrical maintenance engineers concerned with oil-immersed equipment. Topics include general properties of transformer oils and causes and treatment of oil deterioration with reference to sampling methods and purification plant. The Electrical Division, Castrol Industrial Ltd., Castrol Hse, Marylebone Rd, N.W.1.

CAWKELL.—Leaflet REM2 depicting applications of "Tele-remscope" X-ray image intensifier used in conjunction with closed-circuit television. Cawkell Research and Electronics Ltd., Scotts Rd, Southall, Middx.

CLAUDE LYONS.—Leaflet describing Type PSS-32/50 high current stabilised d.c. power supply units. Claude Lyons Ltd., Valley Wks, Hoddesdon, Herts.

BURT BOULTON AND HAYWOOD.—Brochure describing "Prinsote" dressing for *in situ* treatment of creosoted wood-poles. Burt Boulton and Haywood Ltd., Brettenham Hse, Lancaster Pl, W.C.2.

ROBERT DEMPSTER.—Leaflet describing rotary dividers for accurate sampling of coke, coal and other granular materials. Robert Dempster and Sons Ltd., Rose Mount Iron Wks, Elland, Yorks.

EMB.— Illustrated catalogue detailing range of a.c. and d.c. industrial controllers for cranes and similar equipment. EMB Co. Ltd., Moor St, West Bromwhich, Staffs.

FALKS.—Revised price list and data sheets of Fal-Fina floodlight, Blenheim lantern wall bracket and consumers' control units. Falks, 91 Farringdon Rd.

G.E.C.—Net trade prices booklet for conduit, conduit fittings and wiring sundries. As from 1 July, 1961. The General Electric Co. Ltd., Installation Equipment Group, Four Ashes, Wolverhampton.

HOLMES.—20-page booklet with colour and monochrome plates describing the principle of electrical precipitation and practical applications of the "Holmes-Elex" electrical precipitators. W. C. Holmes and Co. Ltd., Turnbridge, Huddersfield.

INTERNATIONAL RECTIFIER.—Short form catalogue and price lists for semiconductor devices. Effective since June, 1961. International Rectifier Co. (GB) Ltd., Oxted, Surrey.

JOHNSON, MATTHEY.—Data sheets, revised and enlarged, describing equipment and processes for electrodeposition and electroplating of noble metals. Johnson, Matthey and Co. Ltd., 73-83 Hatton Gn, E.C.1.

MARCONI.—Leaflet describing vidicon camera channel Type BD 896, designed for telecine, and similar static applications. Marconi's Wireless Telegraph Co. Ltd., Chelmsford, Essex.

PANTAK.—Illustrated leaflet detailing mobile constant potential X-ray equipment by Pantak Ltd., Vale Rd, Windsor.

RICHARDSONS, WESTGARTH. — Brochure giving particulars of the new "Maxecon" wet back shell boiler for steam raising or hot-water supplies. Richardsons, Westgarth and Co. Ltd., P.O. Box 2, Wallsend, Northumberland.

S.A. PORCELAIN.—38-page catalogue detailing porcelain insulator products including galvanised iron fittings for overhead lines. S.A. Porcelain Insulator Manufacturers' Association (Pty.) Ltd., P.O. 10533, Johannesburg, South Africa.

SANTON.—New price list, covering July-Dec., 1961, for Santon range of industrial thermostats, hot-water storage cylinders, oil line heaters, etc. Santon Ltd., Somerton Wks, Newport, Mon.

News of the Week

N.I.C. Unhappy About Earthing

Current-balance relay may be the answer

STANDARDS of earthing, particularly where earth-leakage circuit-breakers are used, leave much to be desired. This is suggested in the latest progress report of the NICEIC. Inspecting engineers of the Council find this notably where water supply authorities refuse to permit a connection to their system as the principal means of earthing an electrical installation.

In such circumstances, difficulty arises if the electricity board is unable to provide a satisfactory earth connection to their system. In that case, contractors have to fit earth-leakage circuit-breakers. It is not always realised that protective equipment of this type is "completely useless if the earth electrode to which the trip coil is connected cannot be positioned outside the resistance field of any other earthed metal."

Water supply authorities are not always aware that segregation of electrical from water systems in a building is quite impossible where an immersion heater is installed in a hot water tank.

In the opinion of the NIC, e.l.c.b's of the voltage-operated type are frequently not installed, tested and maintained so as to give proper protection—although they are efficient devices if properly dealt with. Data obtained by the NIC during the last few months gives statistical support for this judgment.

The NIC concludes that "there are some serious disadvantages associated with the voltage-operated earth-leakage trip, and it might very well be worth while pursuing investigations into the use of a more satisfactory protective device."

The answer may come, the report suggests, in the current-balance relay. A demand is seen for this relay, and hope is expressed that such equipment will soon be available at a price comparable with that for a voltage-operated e.l.c.b. Much will depend on the minimum value of out-of-balance current at which the relay is required to operate.

The same progress report that includes this technical discussion also gives statistics of April-June recruitment to the roll of approved contractors. 55 applications for enrolment were approved, and 13 rejected. 71 applications were deferred for a further inspection. 28 firms were removed from the roll, and 95 new applications for enrolment received.

Capital for Nationalised Industries

ESTIMATES for State lending to the nationalised industries were given in a written Parliamentary answer by the Chancellor of the Exchequer, in the form of the table shown below:

Nationalised Industry	Actual Advances Apr. 1960 to June 1961	£ million estimated Advances Sept. 1961 to Aug. 1962
Electricity Council ...	224	215
North of Scotland HEB	11	16
South of Scotland EB ...	25	23
Gas Council	24	20
British Transport Commission	172	139
British Overseas Airways Corporation	43	40
British European Airways Corporation	25	27
Total	524	480

PAY CLAIM LODGED

THE expected pay claim on behalf of manual workers in the electricity supply industry, foreshadowed in our 13 July issue, was presented by the unions' representatives at a meeting of the National Joint Council at Newcastle upon Tyne last week. No figure was mentioned, but a "substantial increase" is being sought. It has been referred to the Negotiating Committee.

A.E.I. TO CLOSE TOTTENHAM FACTORY

AEI (Woolwich) is to cease all activity in the manufacture and sale of transistors and semiconductors. This subsidiary manages the AEI group's Radio and Electronic Components Division and the Telecommunications Division, among others. However, the semiconductor activities of divisions under the management of AEI (Rugby) are in no way affected. For example, the Heavy Plant Division will continue to make semiconductors for power purposes and the Electronic Apparatus Division will continue the manufacture of a wide range of light and medium semiconductors for military, computer and industrial applications.

To implement the decision, the Tottenham factory of the Radio and Electronic Components Division will be closed down gradually after the August recess. The manufacture there of PTFE products, special electronic apparatus and electro-medical equipment will be transferred to the nearby Brimsdown factory. Of the 600 employees at Tottenham, just over 200 have been engaged on transistor production. These will progressively become redundant, but most of the remainder will be offered work at Brimsdown.

PLESSEY SELL ROSITE LTD.

MYCALEX and T.I.M. Ltd., of Cirencester, have acquired Rosite Ltd., hitherto a Plessey subsidiary. Rosite Ltd. was set up in association with Rostone Corp., of Indiana, in 1957 to manufacture a range of cold moulded insulating products in this country. Plessey say the range has proved highly successful, but to keep pace with current technology Rosite has to expand into fields outside basic Plessey product policy. Rosite is already involved in "substantial development" of hot moulded materials. The transfer of plant from Swindon to Cirencester over the next few months will not affect deliveries, the announcement says.

END OF FIXED PRICE LIGHT CO.

THE Fixed Price Light Co., after over 50 years of service to the smaller consumer, has decided to cease operations. Now a wholly owned subsidiary of Associated Electrical Industries, the company still serves some 8,000 consumers in various parts of London, chiefly around Southwark, Lambeth, Bermondsey, Camberwell, Deptford and Poplar. A number of its customers are in buildings scheduled for demolition, but all are being given ample warning that operations are to end, probably within the next three years.

The company was formed in 1909 and, in the subsequent years, fulfilled a very useful function in providing electricity for lighting only to people who could not afford a large outlay, yet wanted electric light. The company obtained a bulk electricity supply, wired the consumers' homes and charged a fixed amount for each light, usually about 1s/60 W lamp in winter and 9d in summer.

These installations were designed solely for lighting when supply voltages were around 200 V, and it may well be that many will necessitate renewal for safe present-day use. Arrangements are being made with the LEB and Seeboard to ensure that the change in operations will cause as little inconvenience as possible to the consumer.

E.T.U. ON PAY PROBLEMS

MATTERS relating to apprentices figured prominently in discussions, sandwiched between much political talk, at the annual conference of the Electrical Trades Union at Portsmouth last week. It was decided to negotiate with the NFEA for a substantial increase in the percentage rates of apprentices' pay. Another resolution, which was carried, called for measures to give greater protection of employment and conditions to apprentices in contracting, especially in Scotland, by seeking more binding responsibility upon employers.

A further resolution, that the present outworking allowance should be augmented owing to the increased cost of accommodation, was also adopted after the president, Mr F. Foulkes, suggested that electrical workers should, when working away from their home towns, keep hotel or boarding-house bills.

The delegates also agreed that the union should press for a third week's holiday with pay in the contracting industry, in addition to a sick-pay scheme.

A resolution seeking the conference's endorsement of the recent restrictive action of the Executive Council, taken during a private session, was adopted by 216 votes to 145 votes, and the size of the opposition vote evidently surprised the pro-Communist faction. The resolution also demanded that the general secretary should carry out the instructions of the Executive Council and its sub-committees.

During another private session, on Thursday, the Conference agreed to raise the salaries of the union's full-time officials by 12½%. Mr Foulkes' and Mr Byrne's pay goes up from £1,320 p.a. to £1,485 p.a. The increase is based on wage improvements in the three main industries with which the ETU negotiated during the two years since the officials last received a rise.

Presenting the union's financial report, Mr J. T. Byrne, general secretary, said the general fund stood at £958,102 at the end of December, 1960.

Electricity and Amenity

ONCE again there is a lengthy section of the annual report of the Council for the Preservation of Rural England devoted to electricity. But it is a measure of the attention the supply industry gives to amenity that much of the space in that section of the report is devoted to quotations from speeches by Sir Christopher Hinton about the importance of amenities. No general discussion of the principles applying to electricity in the countryside is offered this year, although several specific cases are reported in some detail.

Motors for Ford's Plant

THE Ford Motor Co. have specified that all electric motors for their new factory at Halewood, on Merseyside, are to be made by Associated Electrical Industries Ltd. Orders obtained by AEI for the factory, amounting to £167,000, cover motors ranging from ½ h.p. to 850 h.p., and three 12,500 kVA three-phase transformers. They include 56 s.c. motors of from 12½ h.p. to 75 h.p. for driving air-conditioning fans, 69 s.c. and slip-ring motors from ½ h.p. to 150 h.p. for operating car body presses, and 13 75 h.p. slip-ring motors for driving presses. Four 70 h.p. s.c. motors have been ordered through John Lysaght and Co. for fan drives, and ten pump motors rated from 125 h.p. to 150 h.p. through Hayward Tyler and Co. AEI motors will power the cranes being supplied by J. H. Carruthers and Co., and the conveyor equipment by G. S. King Ltd., while five 850 h.p. and two 230 h.p. synchronous induction motors will drive Alley air compressors.

M-R SERVICING

A NEW service administration centre, depot and central store is being opened by Morphy-Richards at the Industrial Estate, Weedon Rd, Northampton, on 8 Aug. That location has been chosen as a strategically placed group base to co-ordinate the activities of the network of service depots and field service engineers at 10,000 dealers. A new main London service depot has also been established at 29-31 Scrutton St, Shoreditch, E.C.2. The service depot for S.E. England remains at St. Mary Cray.

PHYSICISTS IN CONFERENCE

PLANS for two conferences and a symposium are announced by the Institute of Physics and the Physical Society. That most directly involved with electrical engineering is a conference on the physics of gas discharge devices, to be held at Leamington Spa on 28 and 29 Sept., 1961. Topics discussed will include heavy current switching, problems of arc control, very-high-current mercury pool switches and thermionic energy converters, besides a number of related questions. The meeting is being organised by the electronics group of the society.

The other conference is a joint one with the British Radio Spectroscopy Group, and will deal with the radio-spectroscopy of solids. It will be held at the University College of North Wales, Bangor, on 21 and 22 Sept., 1961. A symposium, on 20 to 22 Sept., 1961, is planned to cover aspects of the physics of space research. It will be a residential meeting at the Royal Military College of Science, Shrivenham.

Details of all these meetings are available from the Administrative Assistant, the Institute of Physics and the Physical Society, 47 Belgrave Sq, W.C.1.

Chancellor's Axe Hits Hard

FULL details of the Government's plans to deal with the economic situation became available only in the late stages of our preparing for press. Discussion of the effects of the 10% surcharge on Customs and Excise duties, including Purchase Tax, and of the increase in the Bank Rate to 7% (2% up) will be included in our next issue.

The 10% "Special Surcharge" will fall to be paid at the normal time that Purchase Tax payments are due under present arrangements. The increased rates have applied from midnight on Tuesday last. In his introductory statement the Chancellor said home demands had continued to increase since the Budget and were likely to increase even more than was foreseen when the Budget was prepared. Labour shortages were evident in most areas and investment was rising strongly.

OFFICIAL PUBLICATIONS

Weights and Measures (No. 2) Bill. HMSO. 6s 3d (see page 133).

BS 1991. Letter Symbols, Signs and Abbreviation; Part 2, Chemical Engineering, Nuclear Science and Applied Chemistry (10s); Part 3, Fluid Mechanics (7s 6d); Part 4, Structures, Materials and Soil Mechanics (12s 6d); Part 5, Applied Thermodynamics (7s 6d).

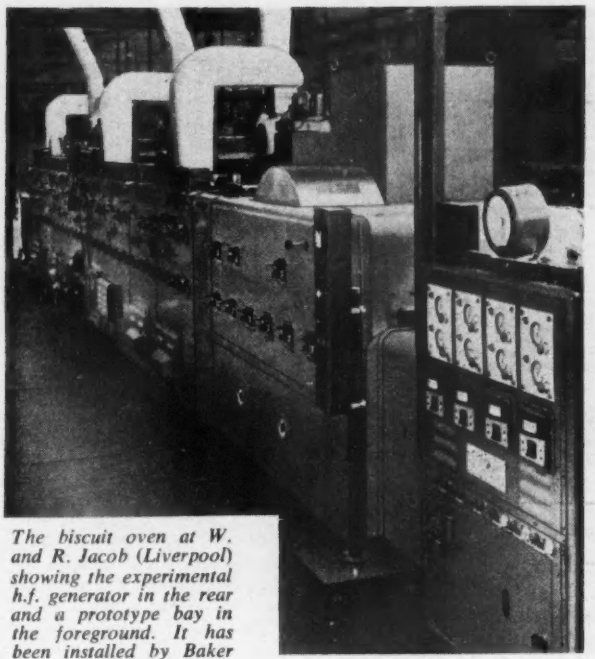
BS 3369. Unified Miniature Screw Threads. 5s.

New Offices For John Thompson

WITH the opening of new offices at Tavistock Hse last week, the John Thompson Group have centralised their London activities. The new premises, part of the recently constructed east wing, houses among others in the Group, Thompson Brothers, Darham Industries, John Thompson Compost Plant and Thompson-Tappan. Group headquarters will still be at Wolverhampton, where the majority of member companies have their head office. Internally, the premises are divided into several offices with acoustic ceilings incorporating radiant heating and flush-mounted lighting fittings. There is also a display room where photographs and models illustrate main products of the Group.

A.M.P's Glasgow Factory

A NEW 60,000 sq ft factory at Port Glasgow for Aircraft-Marine Products (Gt. Britain) Ltd. is to be officially opened on 25 Sept. by the Secretary of State for Scotland, the Rt Hon John S. Maclay. The increased production capacity will enable the company to deal with the expanding world-wide market for its solderless terminals, connectors and associated products.



The biscuit oven at W. and R. Jacob (Liverpool) showing the experimental h.f. generator in the rear and a prototype bay in the foreground. It has been installed by Baker Perkins Ltd.

QUICKER BISCUIT BAKING BY H.F.

AN accelerated biscuit baking system by means of dielectric heating has been installed, at the Liverpool factory of W. and R. Jacob, by Baker Perkins. The system which also uses convected and radiated heat has obviated the manufacturers' problem of obtaining increased production in the same or smaller space without prejudicing quality. In the design of this system, Baker Perkins collaborated with Redifon Ltd. who produced the radio frequency heating equipment employed in the integrated unit. This had to be specially designed to suit the oven. One problem arising from the use of dielectric heating found was that although the biscuits were thoroughly cooked, conventional heating was required to obtain a finish acceptable to consumers. To obtain this effect direct gas firing was used although turbulence had been introduced to increase rate of heat transfer and ensure even baking in the face of large heat input.

The complete installation has already produced a variety of biscuits. It has been found that dielectric heating saved more time when manufacturing soft dough biscuits at the beginning of the cycle because it accelerated the rise in temperature of the biscuit. With the exception of cracker type of biscuits production time was reduced by between 33% and 50%.

Although there was little difference between biscuits baked by dielectric and conventional methods there was a tendency towards greater bulk and greater control over moisture with the first system.

The new method has the advantage of space saving and it is said that a 104 ft direct gas-fired oven with five high powered Redifon high frequency generators produced an output equivalent to conventional units of 220 ft to 300 ft in length.

Silver Jubilee in Television

AFTER celebrating 25 years in the television field, EMI Ltd., Hayes, are casting their eye toward the colour television market. Mr P. Allaway, managing director, forecast an experimental service in the next year or two. On Wednesday last week some of the pioneers of television in the 30's, including Isaac Schoenberg who started work in this sphere at EMI's laboratories, were invited to Hayes for the celebration of 25 years in the TV industry.

Looking toward the colour television of the future the company has already sold 27 sets in this country, mainly to industrial and medical users.

New Weights and Measures Bill

A NUMBER of changes from the text as published last November are apparent in the Weights and Measures (No. 2) Bill now formally before the House of Commons. The Bill has been changed to meet some objections made during House of Lords debates. Sections of the Bill affecting engineering and scientific standards seem to be unaltered, most of the changes bearing on retail trade.

All-electric City Centre for Perth

PERTH'S all-electric city centre, which was officially opened last Friday, is based on the winning design of an all-Scotland architectural competition. The centre, designed to make full use of off-peak electricity, is the first of its kind in the NSHEB area and has an estimated a.d.m.d. of 375 kW off-peak and 300 kW normal tariff.

The centre comprises 11 shops with, on the first and second floors, 23 flats, four private offices and a large office suite for the Inland Revenue. Underfloor heating is installed in the flats with air thermostat control, but in the office suite the 140 kW heating installation, constituting the main off-peak underfloor heating load, has its charging period determined by a thermal control unit mounted outside the building. Each flat also has a 2·3 kW immersion heater, a 2 kW electric fire and a three-plate cooker. Clothes drying facilities, consisting of 5 kW convector heaters and extraction fans, are provided for the flat tenants in six drying rooms. The four private offices have block storage heaters with a total loading of about 26 kW and controlled by a time switch for off-peak tariff operation. Power is provided from a 1·5 MVA substation on the ground floor, with separate circuits for the off-peak and normal tariff loads.

E.D.A. release Greenhouse Film

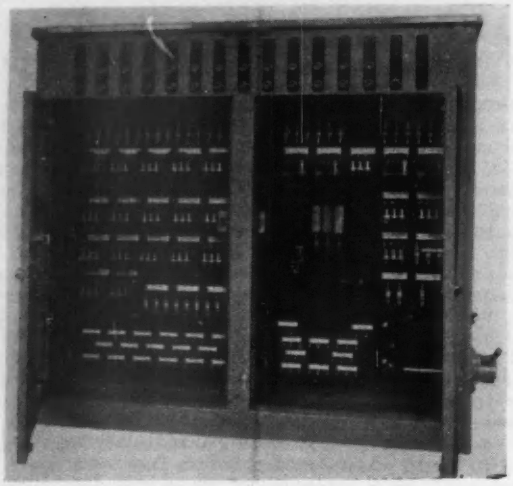
A TEN-MINUTE colour film showing the latest electrical aids to raising plants in greenhouses has been added to the EDA film library. Like other EDA films, it is available on free loan, and bookings are now being invited from amateur gardening clubs and other interested bodies. Entitled "Electricity in Your Greenhouse" the newcomer is available in 16 mm and 35 mm. The scene of the film is the garden of Mr Roy Hay's Surrey home. Starting in the greenhouse in February, the film goes on to show the results in summer after the plants have been transplanted. Mr Hay takes the audience on a tour of his garden and provides the commentary.

REACTOR RESEARCH

UKAEA research in support of the Magnox type gas-cooled graphite-moderated nuclear reactor is running at about the same level as last year. This is stated in a written Parliamentary answer from the Parliamentary Secretary for Science, Mr D. Freeth. He went on to say that the Authority are collaborating with the industrial consortia in research and development of steels for pressure vessels. CEGB work is primarily concerned with operation and economic use of the reactors. A further question about work in support of the advance gas-cooled reactor drew the reply that the UKAEA are making increasing use of industry in research on materials for fuel elements and the construction of reactors. Contracts have been placed for stress investigations into advance designs of pressure vessels.

B.I.C.C. in Australia

IN our note on 15 June on opportunities for industrial investment in Western Australia, reference was made to BICC along with a cable manufacturing plan. The latter referred to Cable Makers Pty. Ltd., but BICC ask us to make it clear that they only perform the function of commercial and technical advisers to that concern—it is not a subsidiary.



Plant for Philippines Flour Mill

This 25-motor panel is the largest of 10 multi-motor control panels being supplied by Allen West and Co. for a new flour mill in the Philippines. The order includes four control desks each with a process timer to give a starting pulse to 23 motor starters at intervals of three sec., and 100 individual starters. The order was received through Thomas Robinson and Son, of Rochdale, who are supplying the machinery for the 200-ton-a-day mill

Trend to Electric Living in Midlands

A ONE-IN-A-HUNDRED spot survey among Midlands homes has revealed a growth in the use of electricity for cooking and water heating, relative to other fuels, and near saturation of TV. Compared with five years ago, the proportion of homes with electric cookers has risen from 21·5% to 28·7%, with the rural areas leading the way. Shropshire and Herefordshire have 48·1%, compared with 34·6% in 1955.

The survey, the second of a five-yearly series being conducted by MEB, shows that the proportion of homes without any form of piped hot water has fallen from 33·3% to 22·4%, while the saturation of electric immersion heaters has risen from 19·1% to 35·5%. Of the Board's seven sub-areas, Birmingham has the biggest proportion of immersion heaters, with an overall average of 45%. In Solihull district, this form of water heating is being used in 67·8% of homes.

Refrigerators are up from 6·4% to 17·5%, but cannot match the jump in TV from 43·6% to 83%. Electric space heating was found in 68·5% of the homes, against 65·3% five years ago, with Solihull again in the lead at 86·1%.

DIP.TECH. A SUCCESS

THE Diploma in Technology scheme is proving a success. That is the atmosphere of the annual report of the National Council for Technical Awards for the year ending March, 1961, published this week. Numbers of students studying for the diploma continue to increase, and the diploma is receiving widespread recognition as a worth while qualification.

During the period covered, nearly 5,000 students were taking Dip.Tech. courses, compared with 3,800 in the previous year. For electrical engineering, the figures were 1,414 and 1,159. Seventeen electrical engineering courses were available.

About 83% of engineering students and 56% of students of other technologies were based on industry, i.e., were employees of firms. The Council have been impressed by the growth in the number of students following sandwich courses in technologies other than engineering.

Almost one-quarter of the year's first-year students entered courses by virtue of holding a good ONC. But for the development of Dip.Tech. few of them would have had an opportunity of progressing to a degree-standard qualification.

During the year there were 25 applicants for registration as candidates for the higher qualification, Member of the College of Technologists (MCT). This makes 34 since the scheme was launched in November, 1959.

During the year covered, 110 diplomas were awarded in electrical engineering, including nine of first-class honours and 73 with second-class honours.

Neutral Current in Lighting

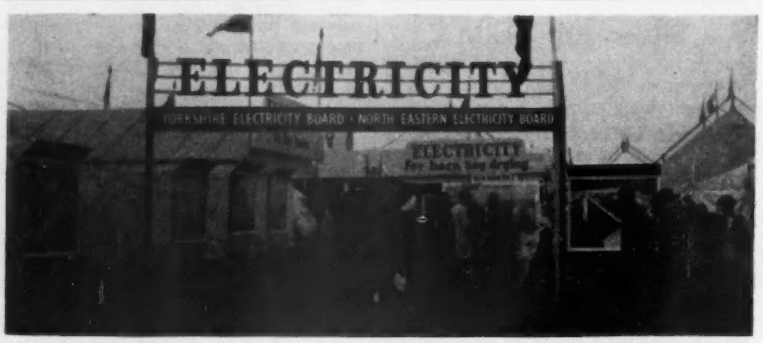
WE have been asked to point out that in some reprints of the above article by Mr J. Flood, there is an error in the reference to Fig.1(b) in the text. Fig. 1(b) represents a conventional switchless start circuit as stated in the caption, not a semi-resonant switchless start circuit as the text of the reprint says.

LARGE ORDERS AWARDED

A £74,000 order for the supply and installation of 0·45 sq in. 33 kV oil-filled cables and associated pilot cables between Frogmore and Hemel Hempstead, has been obtained by Pirelli-General Cable Works Ltd., from the Chilterns sub-area of the Eastern Electricity Board.

AEI have received an order from the Yorkshire Electricity Board for an 11-panel 33 kV metalclad switchboard to be installed at Scunthorpe South grid supply point. Four of the feeders controlled by the switchgear will provide additional 33 kV supplies to Appleby Frodingham steelworks. Allied to the order is one from the CEGB's North Eastern Region for two 132 kV isolating switches and ancillary equipment to control the h.v. side of the transformers.

A £238,000 contract for the supply and installation of some 13¼ miles of 132 kV power cable at Cardiff has been awarded to British Insulated Callender's Cables Ltd. The link between Cardiff East and West substations will comprise one circuit of three single-core oil-filled cables with 0·85 sq in. copper conductor. The cables will be sheathed with corrugated seamless aluminium with an extruded p.v.c. oversheath. The circuit, to transmit a load of 180 MVA, will be interconnected at joint positions to form a cross-bonded system to minimise sheath losses and sheath voltages. Included in the contract, are 132 kV interconnections between Cardiff East substation and the terminal tower of the o.h. lines from Upper Boat, as well as 33 kV interconnections.



The joint "Electricity" stand of the Yorkshire and North Eastern Electricity Boards at the Great Yorkshire Show, Harrogate, included exhibits and demonstrations of all types of equipment. A section, designed to attract the broiler producer, showed a model of a warm-floor brooder. For horticulturists, a large greenhouse was fitted with mist propagation, plus soil-warming and automatic watering equipment

FIRES AT POWER STATIONS

FIRES occurred at two power stations last week-end—at Portobello (Edinburgh) and at Skelton Grange "B"—but in each case electricity output was unaffected and the fire was soon under control. At Portobello, two main coal-conveyor belts, together with their drives, were damaged in a fire on Saturday evening, the blaze apparently starting in a coal bunker. At Skelton Grange the outbreak occurred in a regenerative air heater unit.

Industrial Ergonomics Report

A VERBATIM report of a three-day conference on ergonomics in industry, held last September under the auspices of the Department of Scientific and Industrial Research, was published on Friday. The conference, attended by 300 delegates from industry, trade unions and other bodies, discussed the problems of ergonomics—fitting the job to the worker. It also brought to senior staffs' notice the advantages of this study and gave them an opportunity to discuss its wider application. The report, "Proceedings of Conference on Ergonomics in Industry," is published by HMSO at 12s 6d.

WELDING ENGINEERING 1962

WELDING for Power Generation is to be the theme for the spring meeting of the Institute of Welding at Buxton from 30 April to 4 May, 1962. The Institute is also organising its first large-scale exhibition and the allied processes and techniques in connection with the meeting. Nearly 30 papers, including several from other countries, are to be presented.

Sayings OF THE WEEK

"You must forgive the average British businessman if he asks why Canadians should be so sensitive about keeping the British market open to Canadian goods when at the same time they are proposing legislation which will curtail British opportunities in the Canadian market." . . . SIR NORMAN KIPPING, at Canadian Chamber of Commerce luncheon.

"Accountants . . . are largely trained to find legal ways of avoiding moral honesty. Such probably accounts for their spectacular success in the higher echelons of big business." . . . H. BENNETT, writing to the *Daily Mail*.

"Unity does not mean getting 100% of your own way. You may have to go 99% of the other fellow's way. If you get 1% you get something you wouldn't have got had you not had unity." . . . MR FRANK FOULKES, president, at the ETU conference.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, July 25

	£ per ton	Weekly change £
COPPER, standard class A (settlement) ...	231½	+3½
,, (3 months)	234½	+2½
LEAD, refined pig, 99·97% purity (cash)	66½	+1½
,, (3 months)	67	+1
TIN, refined, min. 99·75% purity (settlement)	915	+8
(3 months)	925	+7
ALUMINIUM, ingots 99·99·5% ...	186	—
,, wire bars (4×4×54")	193½	—
BRASS Strip 63/37	198½	—
SILVER (Troy oz)	79½d	+⅛d
ZINC, virgin, min. 98% purity (cash)	78½	+1
,, (3 months)	79½	+⅛
RUBBER, per lb No. 1, RSS, spot	24⅛d	−⅛d
c.i.f. basis, ports, Oct. ...	24½d	−⅛d
ARMOURING: Galv. Steel Wire (0·104 in.) ...	69	—
Mild Steel Tape (0·04 in.) ...	53½*	—
NICKEL (home)	660	—
MERCURY (76 lb flask)	65	—
AMERICAN PRICES: Copper, electrolytic (per lb) ...	31c	—
Lead, (New York)	11c	—

* *Tape Price, now on average, includes varnishing*

ANOTHER BIG BROTHER?

IT was no good individual councils protesting against increased charges introduced by the Southern Electricity Board, what was needed was for local authorities to make a joint effort in the matter. That was the view expressed by Major C. E. Awdry, of Calne and Chippenham Rural Council at a meeting of the Wiltshire Rural Councils' Association. He suggested the setting up of an organisation in Wiltshire which would investigate the figures when a new tariff was introduced. It needed to be dealt with on an accountancy basis so that the figures could be challenged, if they were in fact challengeable. (We reported on 29 June that 47 local authorities had indicated support for Christchurch Council's protest against SEB's new tariffs.)

Pointing out that the general rate fixed by local authorities could still be tested at quarter sessions, Mr E. M. Nottage, clerk to Amesbury Rural Council, asked if, as local authorities, they would like every corporate body to question their rates every time, simply because they go up nearly every year?

When Mr W. S. G. Mills, of Highworth Rural Council, suggested inviting a representative of the SEB to explain the need for the increased charges, Mr C. S. Brown, secretary, remarked that it was rather late to do anything about protesting against the recent tariff increase, but local authorities might consider the setting up of such an organisation as Major Awdry suggested.

It was agreed to raise the matter again at the Association's next meeting.

COOL AIR IN CONFERENCE ROOM

A COOL atmosphere pervades the conference room of Broadway Hse, Tothill St, London, headquarters of the Engineering Employers' Federation. Reason for this is the air-conditoning system recently installed by Carlyle Air Conditioning and Refrigeration Ltd., and used for the first time last week. The conditioner comprises a Carlyle type 38 R12 fan coil unit with resistance type electrical heater battery. Conditioned air is distributed by four large ducts terminating in adjustable ceiling diffusers. Return air is ducted at a low level from vents in alternate window sills on the east and west sides of the hall. The system is controlled by a Satchwell Duotronic electrical control and the installation is designed to maintain a constant temperature of 70°F.

News in Brief

A new edition of the roll of approved electrical installation contractors has just been issued by the NICEIC.

"Lighting Through the Ages" is to be the subject of a broadcast on the BBC Home Service today, 27 July, at 5.40 p.m., by Mr R. A. Hall, regional engineer of the British Lighting Council for N.E. England.

The 280 ft high chimney of Birkenhead's Shore Rd power station is to be demolished. The station was built to supply the Mersey Railway when it was electrified in 1903.

A contract has been placed with T. G. Construction Co. for the construction of a new six-storey office block for the Midland Electric Board.

The North Eastern Electricity Board have opened new showrooms at Thirsk.

The Midlands Electricity Consultative Council is to meet the Electricity Council to protest at the increase in domestic electricity tariffs which became operative on 1 April.

Plessey's new mobile showroom has started its first journey on behalf of Plessey Nucleonics Ltd. It is touring nuclear power stations and manufacturers with nucleonic interests.

As many readers will have observed, the illustration of the reactor pile cap at the Latina nuclear power station on page 76 of last week's issue was inadvertently inverted.

At the ASEE Golfing Society July meeting, the Hugo Falk trophy was won by R. Dolamore, with W. J. C. Stewart runner-up, and the Thermodare trophy by M. Paterson, with S. Mills, runner-up.

OVERSEAS NEWS

from our correspondents abroad

CANADA

Sets for Otter Rapids

The Hydro-Electric Power Commission of Ontario has ordered two 43 MW generators for the Otter Rapids project from the Canadian General Electric Co. Ltd. Two similar machines are scheduled for operation this year. The new sets are to be ready by 1963. The Otter Rapids hydro-electric station, on the Abitibi River 23 miles downstream from Abitibi Canyon generating station, operates on a head of 107 ft.

Brantford-Thor Link

The entire Home Appliance Division of Thor Industries Ltd., of Canada, is being taken over by Brantford Washing Machines Ltd., of Brantford, Ontario, as from the end of August, it has been revealed. This merging of interests will result in the latter concern becoming one of Canada's largest purely Canadian home appliance manufacturers. Under the arrangement, Thor will acquire a substantial minority interest in the Brantford Co. The latter concern produces various types of electric ranges in addition to wringer-washing machines, whereas Thor are involved in manufacture of automatic washers and dryers in addition to wringer-washers. Thor are now to concentrate on industrial products and vending machines.

New Appraisal Urged

A plea for greater research in the Canadian electrical industry in relation to new technological developments, and an appeal for a bold financing approach to expand Canada's export market for electrical manufactures, were voiced by Mr D. Cass-Beggs, president of the Canadian Electrical Association at the annual meeting of that organisation, earlier this month. Mr Cass-Beggs, who is also general manager of the Saskatchewan Power Corporation and emphasised that the opinions were his own, suggested more research into battery vehicles, thermal storage and railway electrification. On exports, he said if Canada could sell wheat to the needy nations of the world "on an eat-now-pay-later basis," it might be possible to sell them electrical equipment on a "pay-as-you-use-it basis." Canada, he said, was now entering a period where, for the next few years, increases in the nation's own electrical capacity would apparently be only at about half the rate at which capacity had been added annually in recent years. This 50% reduction in Canadian installations could be serious for the Canadian electrical manufacturing industry, but he felt much of the slack which this could create in the Canadian industry could be taken up by this new approach to the export market. He suggested three main regions might be considered: Asia, excluding China and Japan; Africa, excluding the Union of South Africa; and all of South America. In all these areas, the level of electrification was very low.

ECUADOR

Rationalisation

New regulations to co-ordinate and rationalise the production and distribution of electric energy in the country have recently been issued in Ecuador. In addition to the present Dirección General de Recursos Hidráulicos, an Instituto Nacional de Electrificación is set up to help the Ministry of Development to prepare a national programme consonant with the country's needs and financial resources, to promote the establishment of public, private and mixed-ownership electric companies, and to negotiate internal and external loans. At the Instituto's first meeting, the Minister of Development requested from the Monetary Board an initial credit of up to 10 million sucres, to be made available to the new agency. The Minister also referred to thermal plants worth US $3,200,000 which have been donated by the USA and which could provide some 20,000 kW if expenditure totalling US $720,000 were devoted to putting them into operation.

ARGENTINA

Underground Problem

The possibility of transferring the Buenos Aires underground railway to a specially created joint enterprise, and the trolleybus services to private ownership, is being considered we understand. It has also been reported that Government representatives were negotiating in Europe to obtain finance for the extension of the underground railway system by 40 km.

CONGO

Supply Merger

By the merger of two existing undertakings, a single company is now responsible for the production and distribution of electricity in Leopoldville, in the Congo. The two undertakings concerned are Coletrict (Compagnie Africane d'Electricite) and Sanga (Societe des Forces Hydro-Electriques de la Sanga).

EGYPT

S. Cairo Station Order

A contract for the construction of the South Cairo power station, valued at £E6 million, has been won by the English Electric Co. Ltd. But as part of the deal, that company has agreed to purchase four lots of Egyptian cotton over the next four years.

INDIA

Power Plan

By 1966 some 7,000 MW of additional generating capacity will be installed at various sites in India, according to the latest estimates. Schemes completed during the Second Plan raised generating capacity by 2·3 million kW. At the end of the First Plan the total installed capacity was 3·4 million kW. In addition to 94 continuing power schemes from the Second Plan and 14 from the First Plan, 184 new power generation schemes have been included in the Third Plan. Out of 71 schemes which had spilled over from the First Plan, 57 were completed during the Second Plan. Compared with the Second Plan target of 35,000 miles, a total of 47,500 circuit miles of transmission lines of 11 kV and above were completed during the Second Plan period. In addition, 66,000 circuit miles of 11 kV and above are proposed to be completed during the Third Plan period. The number of villages electrified up to the end of the First Five-Year Plan was 10,000. As against the Second Plan target of 10.000 villages, electric power was made available to 13,000 villages during the Second Plan period. Another 20,000 villages are proposed to be electrified during the Third Plan.

Scheme for Madras

The plan for the establishment of a 60 MW thermal power station near Madras City was the subject of preliminary discussion earlier this month. Involved in the discussions were a number of industrialists who are sponsoring the scheme with British collaboration.

PAKISTAN

US Cable Plan

An American firm has been given permission by the Government of Pakistan to set up a large plant for the manufacture of cables and wires, we understand. Estimated to cost Rs5 crore, the plant will be established in Karachi, and is expected to be in production within three years. The American firm has already chosen a site for the factory and preliminary work is about to start.

Grid Progress

The West Pakistan Water and Power Development Authority has completed the laying of transmission lines under the primary grid scheme, but some associated work has still to be finished. The entire scheme, which is estimated to

RECIPE– *Take enough ball-bearings to cover a sixpence*

Many go into precision instruments—but whether the rest end up in something very hush-hush or not is rarely known to us.

But we have been making them for many years now; they range in size from 1·5 mm. o.d. upward. Some are made with open cups which allow clearance for spindle extensions, ranging from 0·25 upwards.

BELOW ARE SOME OF THEM, ACTUAL SIZE

Full particulars and sizes are available on application.

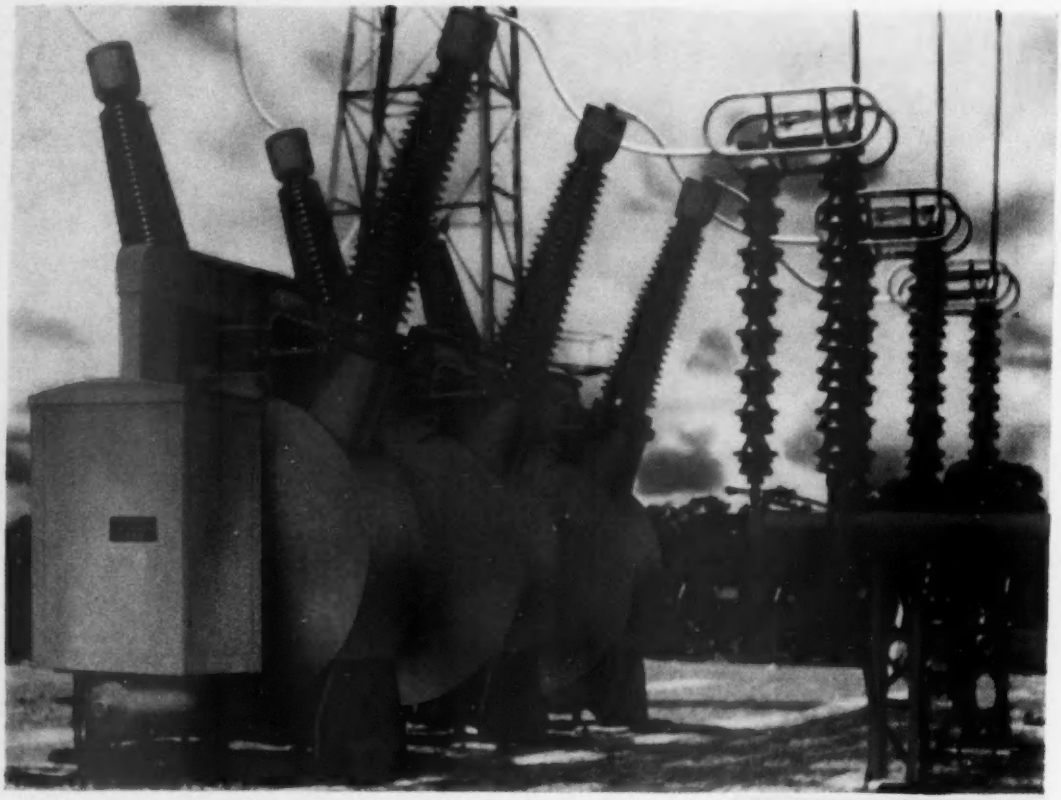
FAFNIR BEARING COMPANY LIMITED WOLVERHAMPTON

MINIATURE BEARINGS

F·B·C FAFNIR

REGD. TRADE MARKS: FBC FAFNIR

AEI Switchgear at KARIBA



Type JW421, 330-kV, 7,500 MVA Oil Circuit Breaker at KITWE Substation, Kariba Hydro-electric Scheme. Consulting Engineers:- Messrs. Merz & McLellan.

A notable contribution to the great Kariba Project is seen in the Switchgear supplied by AEI—one of the largest export orders to be received by a British manufacturer, including twenty-five 330-kV Oil Circuit Breakers and more than one hundred 330-kV Isolators—installed at seven substations in Northern and Southern Rhodesia.

AEI are well qualified to deal with the many problems which arise in connection with major schemes everywhere.

Reduction in the Site Area of the 330-kV Substation at Kariba was an important consideration and this was achieved with the Station layout incorporating AEI Lenticular Tank Oil Circuit Breakers and Vertical Lift Pattern Isolators.

For further information, write to your local AEI Office or direct to AEI Switchgear Division,
Willesden Works, Neasden Lane, London N.W.10.

AEI Associated Electrical Industries Ltd.
Switchgear Division
TRAFFORD PARK, MANCHESTER · HIGHER OPENSHAW, MANCHESTER · WILLESDEN LONDON
F/A 108

cost Rs147 million, is expected to be completed by the end of this year. The network extends over 750 miles and includes a 220 kV line between Multan and Lyallpur and 132 kV lines between Warsak and Lyallpur via Daudkhel and Sargodha on one hand and Warsak Kahrain on the other and double circuit 132 kV lines between Lyallpur and Lahore and Lyallpur and Montgomery. Work is also progressing satisfactorily on the construction of the secondary transmission and distribution scheme.

AUSTRALIA

Derwent Scheme

The construction of three generating stations are proposed in a new power scheme on the Derwent River, Tasmania, put forward by the Hydro-Electric Commission in a report to the House of Assembly. The scheme, for which Parliamentary approval is sought, also provides for the construction of three dams downstream from the Catagunya dam. Together the three stations will have an installed capacity of 85 MW. Cost of the whole scheme is estimated at £11,900,000. The first of the dams would be below the confluence of the Repulse and Derwent rivers, the second would be immediately above the confluence of the Dee and Derwent rivers, and the third on the Derwent River some 20 miles below the Cluny dam. In their report to Parliament, the Commission said that it was expected the whole of the output from the new development would be fully absorbed as soon as the three stations on the Lower Derwent had been completed (estimated 1967). It would be necessary to have a new development ready to enter service very soon after completion of the Lower Derwent scheme.

No Fingal Station?

The local agitation for a thermal power station in the Fingal Valley (reported in our 13 July issue) is not being supported by the Hydro-Electric Commission of Tasmania. In a report to Parliament, the Commission have emphasised that the cost of such thermal power generation would be considerably higher than for a new hydro-electric project. The cost of building and operating a 120 MW thermal station in the Fingal Valley would produce an estimated annual loss of £785,000, when compared with the estimated unit cost of hydro-electric power. This would necessitate a further 10% increase in electricity charges throughout the State. The Premier, Mr Reece, has pointed out that it would be illogical to expect Parliament to approve a thermal station which would impose this added cost. He suggested that the saving of the Fingal Valley coal mining industry was a Federal responsibility, and the proponents for the thermal station should try to convince the Government that £12,400,000 ought to be spent from Federal funds on a 120 MW station there.

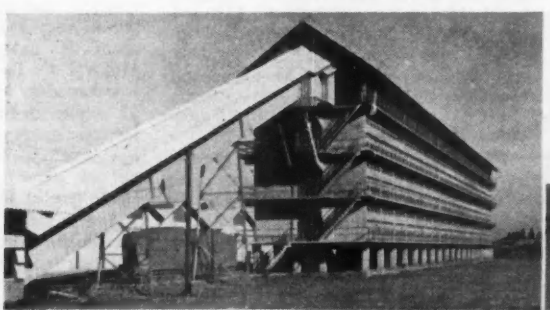
NEW ZEALAND

Looking Ahead

The urgent need to proceed immediately with work on the Cook Strait submarine power cable and its associated 400 miles of overland transmission line, is expressed by Mr F. M. Hanson, Commissioner of Works, in the annual report of the New Zealand Ministry of Works. While realising that only one route—Fighting Bay to Oteranga Bay—for the under-water cable was fully investigated, he believes it to be the correct policy to press on with plans for that route, providing adequate maintenance facilities to prevent any serious interruptions of power supply. But he suggests there should be a reappraisal of the design of the cable with the object of providing all practicable resistance against abrasion and corrosion. And as there is little doubt that more power cables across Cook Strait will be required, perhaps from 1970 onwards, he urges the investigation of other likely routes. On the power development side, the main attention is being devoted to hydro-electric work, although the Wairakei geothermal steam plant is still being developed. There, site work is well advanced for stage II. Last year the maximum output of stage I was 65 MW. The latest hydro-electric station to be commissioned, Ohakuri, is the sixth and farthest up river of the stations completed on the Waikato River. It will have four sets totalling 112 MW. Investigations of the power potential of the upper Waikato area, above Lake Taupo, are nearing completion. It is estimated that about 160 MW could be developed between Lakes Rotoaira and Taupo. In the Bay of Plenty region a 70 MW hydro-electric station is being built at Matahina, at the mouth of the Rangitaiki Gorge. Further upstream a site is being investigated for a 60 MW station, probably at Kopuriki, and engineering investigations are about complete for a proposed 100 MW station near the mouth of the Motu River. The Waitaki Valley is already the scene of many power developments, the largest, Benmore, now being well in hand. Located between the Waitaki and Benmore stations, the Aviemore project, of some 200 MW, has been investigated for feasibility. The upper Waitaki valley is also considered to have a power potential of some 700 MW, of which only 25 MW have so far been harnessed at the Tekapo station.

BANGKOK'S REFUSE COMPOSTING PLANT

Claimed to be the largest of its kind in the world, this all-electric refuse composting plant, recently opened in Bangkok, has its own power plant—three diesel alternator sets. Designed and erected by the John Thompson group in collaboration with Compost Engineers Ltd., the plant produces some 60,000 tons of compost annually from Bangkok's refuse. BICC supply over 7,000 yd of mineral insulated, paper insulated s.w.a. and p.v.c. insulated cables for the project. After passing through pulverisers and dense-particle separators, the refuse is taken to a mixing house and then to the top of the six-storey fermentation house. Each day the mixture is turned and dropped to the floor below, and on reaching the bottom floor is removed to maturing sheds, where decomposition continues for several weeks until the material reaches the best condition—as measured by carbon/nitrogen ratio, pH value and other characteristics—for agricultural use



Left: The fermentation house of Bangkok's refuse composting plant, showing the conveyor from the mixing house. Below: ground level view of the trough turning gear control panels and allied equipment showing the wiring installation

Company Activities

IS the stock market worst now over? Many market men are inclined to answer in the affirmative. The Chancellor's plan to right the long-term wrongs of the economy are now known and have, to a large extent, dispelled the mood of uncertainty which hung so heavily over Throgmorton St. But even before Tuesday's Ministerial prescription for a fitter Britain there were clear signs that the share slide had bounced off the bottom. Bottom, in fact, was reached on the first day of last week when the *Financial Times* index of industrial ordinary shares saucered down to a 1961 "low" of 301·4—its lowest since the 300·4 of 19 Dec. 1960—and some 17½% under its 365·7 "high" of 15 May, 1961. At 301·4 this gave an average dividend yield on the "blue chips" in the F.T. index of no less than 5·21%—considerably higher than the yield of 4·43% which obtained a year ago. What selling there was, therefore, dried up noticeably; in came the "bears" to buy back stock they had previously sold at higher levels, buying orders re-appeared from the public—and up bounced the index to close the week at 312·5 after 313·8.

This, too, was generally the story in the electrical share market. AEI, which had been marked down to 36s 6d at the beginning of the week to yield 8·1%, recovered to 38s while English Electric, down to 30s 6d to yield 6·5%, livened up to 32s 3d. Not quite so resilient, however, were the 5s Ordinary shares of Dimplex. At the start of the week the shares dropped 3s 6d to 75s, cooling rapidly to 69s before a mild rally took them back up to 71s 3d. Even at this level, however, the shares still yield only 2·2% and are way above their 1961 "low" of 47s 9d.

But without doubt one of the biggest shocks of the week came with the publication of the Hoover half-yearly figures. Before tax profits for the six months to 30 June, 1961, amounted to no more than £1,965,000 against £4,013,000 for the corresponding six months a year ago. And although chairman Mr H. W. Hoover is holding the interim payment at 3d a share, the net profit after tax and minority interests was more than halved at £859,000 against £1,960,000. On the news, the 5s Ordinary shares nosedived 6s 6d to 36s 6d, improved the same day to 37s 6d and then struggled back up to 38s 3d by the close of the week's business. The 5s "A" Ordinary shares were slashed from 39s 6d to 35s (at this level they were yielding 6·4%!), recovered to 36s and then finished at a not too disastrous 37s.

GEC's lower profit announcement sent the £1 Ordinary shares crashing 3s 3d a time to a year's "low" of 29s before they recovered to 30s 9d and at which level yield now comes up to 6·5%—provided Mr Lindley is able to repeat the 10% payment this year.—*From our City Correspondent.*

Berry's Electric

The year has started well and prospects of further success could "hardly be brighter," Mr R. Berry reports. With a rise of 43% last year, sales have now more than trebled in the past three years. The new factory at Bletchley is nearing completion.

Broxlea Holdings

Although major contractors to the telecommunication and electronic industries, this concern has not suffered from the trade depressions. In fact, the group trading profit again rose over £10,000 to £52,604 for the year to 28 Feb. last, and the 35% dividend is repeated. That dividend has been paid for the past five years and the directors have it in mind to recommend a suitable increase when next considering a dividend. A one-for-one scrip issue is also proposed.

W. H. Dorman and Co.

The offer for the shares by English Electric Co. has been declared unconditional. Acceptance has already been received from holders of over 85% of the Preference, over 95% of the Ordinary and over 82% of the "A" Ordinary.

Efco Ltd.

With tax charge nearly £30,000 up at £166,442, group net profit for the year to 31 March rose slightly to £156,463 (*£152,890*). Ordinary dividends on increased capital absorb £57,515 (*£51,123*), and £100,000 is transferred to general reserve.

General Electric Co.

Only the diversity of the group's activities in lighting, electronics and other spheres saved it from a loss in the year to 31 March, the preliminary report shows. Heavy engineering margins were meagre and contributed little to earnings, while in radio, TV and domestic equipment the extremely unsatisfactory state of trade resulted in "substantial losses," directors say. Due mainly to these factors, net profit dropped from £2,532,384 to £1,377,677, even though turnover was 1½% higher at £118·6 million (previously £116·9 million). At least the Hunterston nuclear power project has not been a further drag. While the contract was still under discussion at the close of the year, directors believe that the provisions already made, including £500,000 in 1959-60, will be adequate to cover losses. There have, however, been "substantial provisions" in connection with traction activities, no doubt relating to difficulties with the new 25 kV Eastern Region service. Despite the various setbacks, dividend is maintained at 10%, but it absorbs £1,102,500 after tax and is only four-fifths covered by profit after preference commitments have been met. The board's view of the future, likely to be disclosed at the end of this week, will be eagerly awaited.

Hoover Ltd.

The chill wind blowing through the appliance industry is reflected in the over £1 million decline in group net profit of this concern for the first six months of 1961. The figure is £859,000, against £1,960,000 for the corresponding period of 1960, both after tax charge. Although the interim is maintained at 3d/5s share, and overall turnover on the home market was only marginally lower during the period, the directors warn that general costs have shown a marked increase. Intense competition, particularly in Europe, has also adversely affected the picture. In view of the economic uncertainty prevailing, they see little evidence of any improvement in trading conditions in the coming six months.

Newrith Group

The group has commenced the year with a record order book, but margins are unduly low, the chairman states. No substantial increase in earnings is expected.

Pirelli-General Cable Works

The steady improvement in the cable industry this year is reflected in the results of this concern for the 12 months ended 31 March last. Profit comes out at £446,298, which compares with £416,635 for the previous year. But bank and other interest charges jump to £137,079 (*£29,979*) and, after deducting tax provision of £2,572 (*£59,737*) and reserves for tax deferred by initial allowances, £12,508 (*£11,727*), the net profit is down to £165,320, against £192,677 for the previous year. Dividend is trimmed to 5% on capital as increased by a one-for-four scrip issue and one-for-four rights offer, compared with 10% last time on the old capital.

Ruston and Hornsby

The financial year started with a reduction in the working week and during the last quarter a further all-round increase in wages and salaries became payable, says Mr W. J. Ruston in his annual review. On the brighter side, the order intake was at a higher rate and the order book now stands at a much more satisfactory level than a year ago.

Thermal Syndicate Ltd.

A one-for-one scrip issue and a one-for-five rights issue at £3 for the £1 shares are announced by this concern, which makes silical-coated immersion heaters among other things.

Dividend Declared

Mather and Platt. Interim 3%.

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

27 July—Hyde B.C. 75 25 ft concrete columns with 76 140 W sodium lanterns/gear.—See 13 July issue.

27 July—Newbury B.C. 713 Group "B" lanterns, 697 columns, 16 wall brackets, lamps, wiring and gear.—Advertised 6 July issue.

27 July—Richmond (Yorks) B.C. Rewiring, on fixed-price basis, of 21 houses, Bridge Terr. Borough Engineer and Surveyor. Deposit £2 2s, made payable to Corpn.

28 July—Dunbarton C.C. 163 street lighting units in Vale of Leven and Renton Special Lighting District.—See 20 July issue.

28 July—Swansea C.B.C. Electrical installation in Morfydd Hse (Day) Special School extension, Morriston.—See 20 July issue.

28 July—Wembley B.C. 240 sodium and fluorescent Class "A" street lighting units.—See 20 July issue.

29 July—Dublin T.C. Electrical installation in fire station at Dolphins Barn.—See 13 July issue.

29 July—Heywood B.C. Supply of 42 Class "B" columns, 60 W sodium lanterns/gear and 108 time switches.—See 20 July issue.

29 July—Stretford B.C. Electrical installations in 22 houses, Nansen Close, Gorse Hill.—See 20 July issue.

29 July—Weymouth B.C. 145 Group "A" concrete columns and lanterns.—See 6 July issue.

31 July—Birmingham C.C. Inspection and maintenance of housing estate lifts for year.—See 20 July issue.

31 July—Cardiff C.C. Contract B.4. Supply and installation of passenger lift at Sluvad, Panteg, water works.—See 13 July issue.

31 July—Dunbarton C.C. Erection and wiring fluorescent street and footpath lighting, Muirhead 3 area, Cumbernauld.—See 20 July issue.

31 July—Linlithgow B.C. Supply and erection of 140 W sodium lighting on 26 ft columns in m.v. conversion scheme. Burgh Surveyor, 39-41 High St.

31 July—North Armagh Hospital Management Committee. Wiring Lurgan and Portadown Hospital. Registered contractors only.—See 29 June issue.

1 Aug.—Isle of Man. Electrical installation in waiting hall of Sea Terminal, Douglas, for Harbour Board. Details from architects, McCormick and Davies Ltd., Peel Rd, Braddan. Deposit £2 2s.

1 Aug.—Lytham St. Annes. Two 3,500 g.p.m. at 19 ft head vertical centrifugal sewage pumps and motors.—See 22 June issue.

1 Aug.—Ramsbottom U.D.C. Installation of Class "A" sodium lighting, 20 columns, Blackburn Rd.—See 6 July issue.

1 Aug.—Spilsey R.D.C. Wiring of houses: 1-6 Small End, 1-4 Dickon Hill and 1, 2 and 4 Field La, at Friskney; 1-4 Hobhole Bank, Midville; and 1-5a The Rookery, New Leake. Engineer and Surveyor: G. F. Taylor, Toynton Hall.

2 Aug.—Birmingham C.C. Servicing and maintenance work on lifts in public buildings and schools.—See 6 July issue.

3 Aug.—Dudley C.B.C. Erection of 750 tubular steel columns complete with post-top lanterns/gear and installation of 500 lanterns/gear on existing columns.—See 20 July issue.

4 Aug.—Belfast C.C. Supply, delivery and erection of 33 kV and lower voltage cables and accessories.—Advertised 29 June issue.

4 Aug.—Belfast C.C. (b) Electrical installation in Diagnostic Centre and caretaker's residence, Greenwood Hse, Upper Newtownards Rd.—See 20 July issue.

4 Aug.—Edinburgh C.C. Electrical installation, new police station, Gayfield Sq.—See 29 June issue.

4 Aug.—Leyland U.D.C. Contract 33. Electrical installations in 48 flats, Lower Hse estate. Applications to Clerk: W. C. F. Godsell, Council Offices, by above date.

4 Aug.—Newcastle upon Tyne C.C. (c) Electrical installation, on fixed-price basis, in Firfield Secondary Boys' School, Firfield Rd. Applications to Director of Education, H. V. Lightfoot, Northumberland Rd, by above date.

5 Aug.—Chilton P.C. Supply of 12 Class "B" concrete columns, lanterns, 80 W discharge lamps/gear. Clerk, R. Foster, Brida, The Crescent, Chilton, Ferryhill.

5 Aug.—Orrell U.D.C. Supply, erection and wiring complete with lanterns/gear of 44 Group "B" units.—See 13 July issue.

7 Aug.—Laoighis-Offaly. Electrical installation alterations and extensions at St. Fentan's Hospital, Portlaoighis, for Mental Health Board. Details from consulting engineers: J. V. Tierney and Co., 15-16 Duke St, Dublin. Deposit £5 5s.

8 Aug.—Breconshire C.C. Electrical installation in 64,500 sq ft five-stream comprehensive school, Brynmawr. Applications to County Architect, Rhyd Offices, Brecon, by above date. Deposit £2 2s. N.I.C. firms only.

8 Aug.—Ely R.D.C. Electrical equipment of bungalows: six at Littleport; two at Mepal; four at Stretham; three at Little Thetford; and three at Wilburton. Engineer and Surveyor: W. Clifford Jones, 11 Lynn Rd.

8 Aug.—Hawick B.C. Supply of steel columns and mercury vapour lighting for 26 units along A7, Buccleuch Rd.—See 20 July issue.

8 Aug.—Manchester C.C. Supply and installation of announcement system in new terminal building, Manchester Airport. City Architect, P.O. Box 488, Town Hall.

9 Aug.—Sittingbourne and Milton U.D.C. Supply and erection of 150 Group "B" 80 W mercury vapour lighting on concrete columns. Engineer and Surveyor, 89 London Rd, Sittingbourne. Deposit £2 2s.

9 Aug.—Wortley R.D.C. Supply and installation of street lighting in five groups. (1) 93 15 ft columns with 80 W mercury lamps; (2) 31 20 ft columns with 125 W lamps; (3) 26 25 ft columns with 3 x 80 W fluorescent tubes; (4) 68 25 ft columns with 250 W mercury lamps; (5) 77 20 ft and 15 ft columns with 125 W and 80 W mercury lamps.—See 29 June issue.

10 Aug.—East Riding C.C. Electrical services installation in County Secondary School, Fulford, near York. County Architect, County Hall, Beverley.

10 Aug.—Plymouth C.C. Supply: lamps.—See 20 July issue.

11 Aug.—Midlothian C.C. (1) 63 140 W sodium units on concrete columns along A7 near Newtongrange and A68 near Dalkeith. (2) Nine 140 W sodium units/concrete columns on B6455.—See 20 July issue.

12 Aug.—Leeds (A) Gp Hospitals. Applications for inclusion in approved list for electrical work to Secretary, J. Folkard, Management Committee, St. James's Hospital, Leeds 9.

12 Aug.—Oxford C.C. Supply: electrical goods for Cutteslowe Court Old People's Home, Jackson Rd.—See 20 July issue.

14 Aug.—E.B. for N. Ireland. 400 V switchgear for Coolkeeragh Power Station.—See 22 June issue.

14 Aug.—E.B. for N. Ireland. 33 kV 750 MVA metal-clad indoor switchgear.—See 13 July issue.

14 Aug.—N.I. Hospitals Authority. Electrical installations in staff houses at Tyrone and Fermanagh Hospital. Details from architects, W. H. McAlister and Ptnrs, 9 Ferryquay St, Londonderry.

15 Aug.—Cardiff C.C. Supply and installation of service lift at Canton Sub-divisional Police Station. City Architect, Greyfriars Rd. Deposit £2 2s, made payable to Corpn.

18 Aug.—Haslingden B.C. Rewiring of power circuits and incidental works in 20 houses and eight flats, Cedar Ave. Borough Surveyor, Bury Rd.

18 Aug.—Londonderry C.C. Wiring old people's home, Moneymore.—See 13 July issue.

19 Aug.—Saltburn and Marske U.D.C. Supply by overhead cables to and interior installation in three toilet blocks at Caravan site. Engineer and Surveyor, Council Offices, Saltburn.

21 Aug.—East Kesteven R.D.C. Contract 2: two 375 g.p.m. and two 125 g.p.m. sewage pumps and one 100 g.p.m. sludge pump. Contract 3: two 30 p.m. ejectors, all to be complete with motors, starters and accessories for Heckington and Gt. Hale sewerage scheme. Documents from consulting engineers: John H. Haiste and Ptnrs., Belmont Hse, 20 Wood La, Headingley, Leeds 6. Deposit £3 3s, made payable to R.D.C.

21 Aug.—Enniskillen R.D.C. Water pumping

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources, including an index of trade information with over 100,000 entries

A Selection from the 112 queries answered this week

"Titeflex" conduits—address for? F.B.—Gabriel Manufacturing Co. Ltd., Newton Rd, Torquay, Devon.

"Palladium" spin dryers—suppliers of? G.W.—C. F. Lawson Ltd., 3 Station Approach Rd, Coulsdon, Surrey.

"Maddox" kettle—makers of? T.E.—H.M.V. Household Appliances Ltd., Blyth Rd, Hayes, Middx.

Trunking system referred to by *Megohm* in the ELECTRICAL TIMES, dated 13 July, 1961—makers of? T.A.—Craval Ltd., St. Mary Cray, Orpington, Kent.

"Gael" fan heaters—makers of? H.T.G.—Carnscot Engineering Ltd., Carntyne Industrial Estate, Glasgow, E.2.

"Rowenta Fritense" rotisserie cooker—suppliers of? E.D.—Rowyn Ltd., 216 Kensington High St, W.8.

"Vesta" lamps—address for? C.M.—Universal Distributing Co. Ltd., 66 Gt. Eastern St, E.C.2.

"Danasco" lighting fittings—suppliers of? P.J.—Danasco Ltd., 6 Golden Sq, W.1.

Signal Burglar Alarm Co. Ltd.—address for? M.C.—2-4 Earl St, E.C.2.

Domestic hood-type hairdryers—makers of? T.E.—Magicook Appliances Ltd., 115-119 Carlton Vale, N.W.6: Mitcham Mnfg. Co. Ltd., Mitcham Wks, Winchelsea Rd, N.W.10.

plant for Marble Arch scheme.—See 13 July issue.

21 Aug.—Heston and Isleworth B.C. Rewiring, etc., 40 houses, Warren estate, St. Aubyn's Ave. Housing Officer and Manager, Treaty Rd, Hounslow.—Advertised in this issue.

21 Aug.—Ilkley U.D.C. Rewiring of 65 houses. Engineer, Chantry Drive.

25 Aug.—Braintree and Bocking U.D.C. Wiring, on fixed-price basis, of two groups of 28 houses, Wheatley Ave. Engineer and Surveyor, Town Hall, Braintree. Deposit £1 1s each group. N.I.C. firms only.

25 Aug.—Ellesmere Port B.C. 38 Group "A" and 146 Group "B" street lamps and removal of nine Group "B" and 109 gas lamps.—See 20 July issue.

26 Aug.—Bradford B.C. Installation of electric wiring, three dwellings, Scar Hse Reservoir, Harrogate.—See 29 June issue.

28 Aug.—Bury St. Edmunds B.C. Inspection of electrical installations in 65 temporary dwellings. Borough Engineer and Surveyor, Borough Offices.

1 Sept.—Thurrock U.D.C. Erection of columns included in road improvements, Heath Rd and Long La. Documents from consulting engineers: F. S. Snow and Ptnrs., 144 Southwark St, S.E.1. Deposit £5 5s.

4 Sept.—N. Ireland E.B. Main generator/generator transformer connections for No. 4 60 MW turbo-generator.—See 6 July issue.

18 Sept.—E.B. for N. Ireland. Specification N.I.1638. Supply of two 200 kVA and two 300 kVA 3·3/0·4 kV transformers for Coolkeeragh Power Station. Documents from consulting engineers: Kennedy and Donkin, 64 Royal Exchange, Manchester 2. Deposit £5 5s, made payable to E.B. for N. Ireland. Applications by 31 July.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon Hse, Theobalds Rd, W.C.1, quoting reference.*

5 Aug.—Egypt. 3-ton steel melting arc-furnace and gear. Service Public des Tramways du Caire, 1 rue Corniche du Nil B.P. 254. B.o.T. (ESB/23457/61).*

8 Aug.—America. Main control and graphic control boards. Dept. of the Interior, Bureau of Reclamation, Bldg 53, Denver Federal Center, Denver 22. B.o.T. (ESB/23458/61).*

8 Aug.—America. 2,200 bus and switch insulators. Bonneville Power Administration, 1,002 N.E. Halladay St, Portland, Oregon. B.o.T. (ESB/23753/61).*

8 Aug.—Argentina. 10,275 meters. Dept. Electromecania de la Administration General de Aguas, Calle San Luis 52, Salta. B.o.T. (ESB/23042/61).*

11 Aug.—Greece. 15 3 kVA diesel generators. Supplies Dept., Hellenic Telecommunications Organisation, Sophocles St 4, Athens. B.o.T.(ESB/23488/61).*

11 Aug.—Rhodesia and Nyasaland. Domestic washing machines/spin dryers, rotary and flat bed ironers. Secretary, Federal Tender Board, P.O. Box 8075, Causeway, Salisbury. B.o.T. (ESB/23478/61).*

14 Aug.—Australia. 205 5 kVA to 1 MVA distribution transformers. Secretary, H.E. Commission, Elizabeth St, Hobart, Tasmania. B.o.T. (ESB/23461/61).*

16 Aug.—Greece. 300 40 W fluorescent fittings. Supply Department, Hellenic Telecommunications Organisation, Sophodes St 4, Athens. B.o.T. (ESB/24025/61).*

16 Aug.—India. Three 11 kV, 250 MVA o.c.b's. Chief Purchase Officer, National Coal Development Authority, Darbhanga Hse, Ranchi. B.o.T. (ESB/23764/61).*

21 Aug.—New Zealand. 30 24 in. pedestal fans. Director-General (Stores Division), G.P.O., Wellington. B.o.T. (ESB/23464/61).*

22 Aug.—Australia. Two disintegrator units and one submersible pump. Secretary, Metropolitan Water Sewerage and Drainage Board, 341 Pitt St, Sydney. B.o.T. (ESB/23305 and 6/61).*

22 Aug.—Pakistan. Ten 66 kV substations for Multan, Montgomery, Jhang and Lyallpur areas. West Pakistan Water and Power Development Authority, Lahore. B.o.T. (ESB/23428/61/DLF).*

24 Aug.—Sudan. 250 V, 3-phase, 700 A switchboard and 415 V, 1,000 A switchboard. Controller of Stores, Sudan Railways, Atbara. B.o.T. (ESB/24017/61).*

31 Aug.—Australia. Transmission line protection equipment. Southern E.A. of Queensland, Boundary St, Brisbane. B.o.T. (ESB/23074/61).*

11 Sept.—India. Six sets mobile flash butt welding plant for welding rails. Director, Railway Stores Board, Raisina Rd, New Delhi. B.o.T. (ESB/23474/61).*

18 Sept.—Australia. Two 60 MVA 132 kV transformers for White Bay Power Station. E.C. of N.S.W., Kelvin Hse, 15 Castlereagh St, Sydney. B.o.T. (ESB/23462/61).*

25 Sept.—Australia. 310 MVA generator transformer for Vales Point Power Station. E.C. of N.S.W., Kelvin Hse, 15 Castlereagh St, Sydney. B.o.T. (ESB/23016/61).*

CONTRACTS PLACED

Barrow-in-Furness B.C. Electrical installation in crematorium, Hartley and Bramhall Ltd., £2,329.

Brighton B.C. Town Hall lift, Express Lift Ltd., £2,772. Equipment for technical college: motor generator set, English Electric, £927; electrode boiler, Bastian and Allen Ltd., £850; boiler instrumentation, J. Stone and Co. (Deptford); v.s. commutator machine, Laurence Scott and Electromotors Ltd., £1,198; oscilloscope and camera for impulse generator, Southern Instruments Ltd., £2,478. Recommended.

Chelmsford B.C. Electrical installations in 22 old people's flats, Eastern Electricity Board, £3,920.

Cockermouth U.D.C. 16 street lamps, G.E.C. Ltd.

Deal B.C. Provision of mercury fluorescent lighting: (a) Granville Rd/Liverpool Rd/St. Clare Rd; and (b) Deal Castle/Strand, South Eastern E.B., £1,569 and £1,400, respectively.

Heston and Isleworth B.C. Street lighting improvement, Bath Rd, Revo Electric Co. Ltd., £4,635 and supply of 400 time-switches, Venner Ltd., £3 17s 4d each. Recommended.

Kingston upon Hull C.C. Electrical installations in 84 dwellings, Boothferry estate, Hobson and Scott Ltd.

Leeds C.C. Electrical installation in subdepot Blake Grove, Potternewton, B.C.S. Electrics Ltd., £1,219. Recommended.

Morpeth B.C. Electrical installations in 89 houses, Spelvit La, W. Elliott.

Newcastle Hospital Board. Lift installations, West Cumberland Hospital, Wm. Wadsworth and Son Ltd., £70,423; electrical installation, Darlington Memorial Hospital pathological laboratory, Doves Ltd., £3,859; electrical work in Richard Murray Maternity Hospital nursery accommodation, A. S. Lowrey and Son, £1,100.

St. Albans B.C. Supply of columns and 140 W sodium lighting for conversion scheme, Eleco Ltd., £14 13s 9d and £7 19s 9d each, respectively. Recommended.

Stockton-upon-Tees T.C. Electrical installations in new Hardwick Secondary Modern School, Cox-Walkers Ltd., £10,177.

TRADE NOTES

Change of Address. John Gosheron and Co. Ltd. have moved to larger premises at Kensington Church St, W.8.

Annual Holidays. The works of Transformers (Watford) Ltd. will be closed from 11 to 28 Aug.

Agents. Young, Black and Co. Ltd., 152 London Rd, Glasgow, C.1, have been appointed Scottish agents for Ambersil products. Appointed distributors of Ambersil MS4 silicone grease to the radio, TV and electronics industries in England and Wales are Direct TV Replacements Ltd., of New Cross, and for the electrical industry are: British Central Electrical Co. Ltd., London; Caselco Ltd., Leeds; T. J. Grainger and Co., Newcastle; Electrical Trade Supply Ltd., Birmingham, and Holiday and Hemmerdinger Ltd., Manchester.

Brook Canadian Subsidiary. Brook Electric Motors of Canada Ltd. have moved to larger premises on a new trading estate at Rexdale, near Toronto Airport. Behind the office frontage is a warehouse with 10,000 sq ft of floor space to enable better stock service to be given and a wider variety of types to be made available.

Mexican Imports. Electric accumulators for miners' lamps are included among a variety of goods which have become subject to prior import licence when imported into Mexico.

Turkey's Quotas. Among a list of import quotas for the second six months of 1961 announced by the Turkish authorities is one of $500,000 in respect of electric motors. For industrialists, $200,000 is allocated for materials required in the manufacture of washing machines, $200,000 for materials for refrigerators, $200,000 for battery materials, and $500,000 for materials required in the manufacture of radios.

New Depot. Henry Sykes Ltd. have established a depot at Studd Green Works, Elworth, Sandbach. Telephone: Sandbach 986.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Bambi. 805,309. Class 9. Connectors, etc. Hellermann Ltd., Crawley, Sussex.

Circare in design. 815,075. Class 7. Gears and gearing, etc. Associated Electrical Industries Ltd., 33 Grosvenor Pl, S.W.1.

Emicopier. 818,480. Class 9. Photographic and photocopying apparatus, etc. Electrical and Musical Industries Ltd., Blyth Ltd., Hayes, Middx.

Glotex. 811,993. Class 11. Lampshades. Rotaflex (Great Britain) Ltd., 4-10 Nile St, N.1.

Proscontroller. B818,125. Class 9. Instruments for automatically controlling temperature, etc. Process Control Gear Ltd., 44 Lattimore Rd, St. Albans, Herts.

Pye in design. 819,342. Class 11. Nuclear reactors, etc. Pye Ltd., Radio Wks, St. Andrew's Rd, Cambridge.

Resistron. 818,126. Class 9. Measuring apparatus and instruments, etc.; apparatus for indicating the level of liquids, etc. Thomas Industrial Automation Ltd., 71-73 Station Bldgs, Altrincham, Ches.

Roydazide, etc. 817,577. Class 11. Lighting/heating installations, etc. 817,576. Class 9. Scientific and electrical apparatus. Doulton and Co. Ltd., Doulton Hse, Albert Embankment, S.E.1.

Stemmatron. 817,524. Class 9. Electronic tubes, etc. Compagnie Française Thompson-Houston, 173 Boulevard Haussmann, Paris 8e, France.

Transdata. B807,254. Class 9. Scientific and computing apparatus and instruments, etc. George Kent Ltd., 199 High Holborn, W.C.1.

Winguard in design. B810,401. Class 7. Ignition devices for internal combustion engines, etc. Winguard Ltd., Kingsham Rd, Chichester, Sussex.

BUSINESS PROSPECTS

Andover. Omasgrand Property Co. Ltd. propose 39 dwellings, Winchester Rd. 177 dwellings, Barlows La/Chestnut Ave, proposed by Eades Bros. Ltd.

Ashington. Newcastle Regional Hospital Board, Benfield Rd, Newcastle, propose maternity unit, nurses' home and training school, Ashington Hospital. Board architect.

Ashton-under-Lyne. Manchester Regional Hospital Board award £88,889 contract for extensions to operating theatre, General Hospital, to Henry Green and Son (Builders) Ltd., Stocks Hse, Cheetham.

Basildon. M.o.W. propose £300,000 H.M. Stationery Office in a five-storey block. Architects' Dept., John Islip St, S.W.1.

Basingstoke. R.D.C. propose 69 dwellings, Cavalier Rd, Basing.

Bedale. R.D.C. propose 56 dwellings, South End. Architect, Market Pl.

Billingham. U.D.C. appoint Elder and Lester, Town Sq, architects for proposed ten-storey flats.

Bilston B.C. Tender: 269 dwellings, Bradley La South, Rocket Pool site. Housing Director.

Birmingham. £200,000 C.E. secondary school planned at Bordesley. C.C. propose £100,200 girls' training centre, Bristol Rd. Tender: conversion of College of Commerce, Broad St, to Register Office; city architect, Baskerville Hse.

Birmingham Tame and Rea District Drainage Board. Tender: 20 secondary sludge digestion tanks and three alkaline water settling plants, including electrical equipment. M. R. Vincent Daviss, Rookery Pk, Erdington, Birmingham 24.

Boldon. U.D.C. propose 68 houses, Mill Farm. Surveyor.

Bootle. B.C. plan conversion of gas to sodium street lighting in several areas, costing £17,250. Planned. factory at Leckworth Rd for Richmond Sausage Co.; architects: K. Dancer, 14 Hagley Rd, Stourbridge, Worcs.

Bournemouth. Alderney Construction (1954) Ltd. propose new factory premises, 490 Wallisdown Rd.

Cardiff. Powell and Allport, 88 Cathedral Rd, architects for proposed £350,000 Corona factory. G. Percy Trentham awarded £1¼ million contract for extensions to Rover Ltd. Pengam Moor works; architects: Hasker and Hall, Knowle, Warwicks.

Castle Ward. A. C. Luff, builder, Wellfield La, Westerhope, Newcastle, proposes 24 houses, Edgehill, Darras Hall.

Chatham. B.C. propose £76,500 conversion scheme from gas to electric lighting over next 25 years. G.E.C. equipment recommended.

Chelmsford. Watkins and Parks, 27 Rockleigh Ave, Leigh-on-Sea, architects for proposed A. J. Arnold Ltd. new factory, Regina Rd.

Chesterfield. R. H. Ingham, refrigerator manufacturer, 152 Moore St, Sheffield, propose industrial buildings, Pottery La. T.C. propose block of shops and 27 flats, Newbold. Surveyor.

Chingford. London Rubber Co. Ltd., Hall La, E.4, propose £150,000 factory, North Circular Rd; contractors: Kyle Stewart Ltd., Empire Way, Wembley.

Christchurch. Chivers and Sons Ltd., Devizes, Wilts, awarded £157,030 contract for grammar school.

Crawley D.C. Tender: 307 dwellings, Furnace Green area. Chief architect, Broadfield, Crawley.

Croydon. W. H. Robins, 77 Wigmore St, W.1, architect for proposed £90,000 offices, Dingwall Ave, for Land and Property Corpn. Ltd. MacIntosh and Haines, 33 High St, architects for proposed printing works and offices, Wandle Rd, for Croydon Times.

Darlington. T.C. propose improvements to electrical installations in 80 older council houses.

Dorchester. C.C. propose £75,900 improvements to Dorset Farm Institute.

Dudley. Round Oaks Steel Wks Ltd., Brierley Hill, Staffs, propose new factory adjacent to present works.

Durham. C.C. propose training school at fire brigade H.Q., Framwellgate Moor; phase 2 of Bishop Auckland fire station and civil defence garage, Framwellgate Moor. County Architect, South St, Durham.

Edinburgh. James Gillespies high school for girls planned in grounds of Bruntsfield Hse. Cost £600,000.

Essex. Carlton Contractors Ltd., Epsom, awarded £77,200 contract for old people's home, Bevan Ave, Barking.

Falkirk. D.C. propose £178,000 plan to redevelop High St. 140 West George St, Glasgow.

Fordingbridge. M.o.W. propose new post and sorting offices, Salisbury Rd. Architects' Dept., John Islip St, S.W.1.

Finglass. Tender: microwave repeater station, Shelmaliere Common, near Wexford. Architects, Robinson, Keefe and Devane, 22 Large Baggot St, Dublin.

Fulwood. Manchester Regional Hospital Board propose £606,785 developments to Sharoe Green Hospital.

Gateshead. E. M. Lawson, Barras Bldgs, Barras Bdge, Newcastle, architect for proposed conversion of Shipcote cinema to offices.

Glasgow C.C. Tender: several works contracts, St. Joseph's Primary R.C. School, North Woodside Rd. Architect and Director of Planning, 20 Trongate, C.1.

Halifax. Store/supermarket/offices, City Centre, planned by Central Land Investments Ltd., 35 North Audley St, W.1.

Harlow New Town. Geo. Wimpey and Co. Ltd., Hammersmith Grove, W.6, contractors for £160,000 extensions to Norwood Steel Equipment Ltd.

Hastings. 22-storey block proposed at White Rock; architects: Fitzroy Robinson and Ptnrs., 3 Gray's Inn Sq, W.C.1.

Havant. Colt Ventilation Ltd., Surbiton, Surrey, propose factory/offices, Barton's Rd/New La.

Heanor. Aristoc Ltd. propose new factory, North St, Langley Mill, adjacent to present site.

Hemel Hempstead. Fuller, Hall and Foulsham, 212 High Holborn, W.C.1, architects for proposed £200,000 commercial premises, Waterhouse St.

Hertford B.C. Tender: 71 houses, Sele Farm estate. Clerk, The Castle, Hertford.

Hexham. W. Oliver Ltd., 25 Simpson St, Newcastle, propose 30 dwellings, Leazes La.

Hull. Planned: extensions to research laboratory and boiler house, offices and stores, National Ave, for Ideal Boilers and Radiators Ltd. J. Konrad, architects, 112 Park Ave, propose hotel/service flats/showrooms/offices, etc., junction of Albany Rd, Paragon Sq. B.C. propose seamanship training centre to plans by H. Andrew, Customs Hse. Bldg, Whitefriargate.

Huyton-with-Roby U.D.C. Tender: nine shops with six flats, St. John's Rd East estate. Architect, Archway Rd, Huyton.

Leeds. New £190,000 printing works and offices, York Rd, proposed by Jowett and Sowry Ltd.; contractors: Higgs and Hill Ltd., 33 St. Paul's St. Jack Lunn and Co. Ltd., 9-11 Bradford Rd, Stanningley, contractors for proposed R. P. Brindley and Co. Ltd. factory, Camp Rd Mills estate.

Leicester C.C. Proposed: 259 dwellings, Thurnby Lodge estate, costing £367,601. City Architect.

Lindsey C.C. Tender: fire/ambulance station, fire officer's house, Laneham St, Scunthorpe. County Architect, Lincoln.

Liverpool C.C. Tender: 176 flats in 27-storey block, Harding St. City Architect, Kingsway. Proposed: £9,000 substation and installation of underground electric ring main. City electrical engineer.

London. C. Lovett Gill and Ptnrs., 41 Russell Sq, W.C.1, propose extensive redevelopment scheme, Coleman St/Basinghall St. areas: six-, eight- and ten-storey blocks planned. T. P. Bennett and Son, 43 Bloomsbury Sq, W.C.1, architects for proposed 17-storey block, London Bridge Station. London Merchant Securities Ltd., 15 Arthur St, E.C.4, propose £1 million offices, Westminster Bridge Rd. Shops/offices/dwellings proposed, Edgware Rd area; architects: Trehearne and Norman Preston and Ptnrs., 83 Kingsway, W.C.2. 11-storey flats, Norfolk Sq, W.2, proposed by H. R. Ross, architects, 43 Gt. Ormond St, W.C.1. John D. Morgan and David C. Branch, 8 Gt. New St, E.C.4, architects for proposed shops/offices/central tower block, Station Rd, Edgware.

Manchester. Ferndale Marshall (Printers) Ltd., Thorburn St, Ardwick, propose new factory, Dark La. Eight-storey offices, Silver St/Major St, proposed by Central and District Properties Ltd.

Middlesbrough. J. T. Bell, Market St, Newcastle, propose £250,000 hotel/shops/petrol station. Premier Dwellings (Cleveland) Ltd., 157 Albert Rd, propose 208 flats.

Middlesex. C.C. propose £1,482 electric lighting improvements, Twickenham Technical College, and £1,190 fluorescent installations at Hornsey College of Art; remodelling and extensions to Longford Secondary Mixed Schools, Feltham, cost £245,084.

Newcastle. John Laing Construction Ltd., Norham Hse, New Bridge St, contractors for £75,000 students' hostel, Northern Counties College, Longbenton. Regional Hospital Board, Benfield Rd, propose £400,000 extensions to General Hospital radiotherapy dept.

Northants. Arthur E. Craig and Co. Ltd., Broadway, Peterborough, agents for 30 dwellings, Helpston, on Woodgate estate.

North Riding. Morrison and Ptnrs., 103 Belper Rd, Derby, quantity surveyors for proposed Marton primary school. John Laing Construction Ltd., Norham Hse, New Bridge St, Newcastle, appointed contractors for £188,946 Whitby West modern school.

Ormskirk. R.C. authorities plan St. Anne's primary school, Town End.

Peterborough. Planned: 60 bungalows with shops and flats, Werrington, by Sussex estate. Agents: Arthur E. Craig and Co. Ltd., Broadway.

Plymouth. Remington Rand Ltd., 61 Holborn Viaduct, E.C.1, propose new factory, South Way; architects: Bazeley and Barbary, 15 Alverton, Penzance. Factory planned at Estover for Fine Tubes Ltd.; architects: A. F. French and Ptnrs., Pearl Assurance Hse, Royal Parade. Jantzen Ltd. propose new factory, Burrington Farm; contractors: Humphreys Ltd., Sussex St.

Portsmouth. Endurance Furniture Ltd., St. Mary's Wks, Rodney Rd, Milton, propose new factory, Rodney Rd, Fratton. Corporation plan £116,000 mental health centre, Eastern Rd, Milton.

Redditch. Hymantic Engineering Ltd., Glover St, propose three-storey office block. H. S. Cattermole (Hydraulics) Ltd. propose canteen/kitchen/offices, etc., Astwood Bank.

Redhill. £70,000 new printing works, Holmethorpe Rd. proposed by Bridge Walker Ltd., 91 Effra Rd, S.W.2.

Richmond (Yorks). T.C. propose to rewire 21 houses, Bridge Terr.

Scarborough. B.C. propose £49,000 Group "B" standard fluorescent lanterns and tungsten lamps scheme for various roads.

Scunthorpe. K. Scott and Ptnr., 29 Oswald Rd, architects for proposed £300,000 multi-storey flats, Exeter Rd/Doncaster Rd.

Sheffield. Corporation propose additional accommodation for 250 at Totley Hall Teachers' Training College.

Shinfield Park. R.A.F. proposes redevelopment of Flying Training Command H.Q. Plan includes extensive building.

Silloth. R. Evans (Leeds) Ltd., engineering contractors, Leeds, have acquired Silloth airfield for development as trading estate.

Smethwick. Planned: fettling and spraying shop, Oldbury Rd, for Monumental Sheet Metal Work Ltd. United Spring Co. Ltd., Hawthorne St, propose £150,000 works building; contractors: Sir Alfred McAlpine

Business Prospects—continued

and Son Ltd., 49 Waterloo Rd, Wolverhampton.

South Shields. Page, Son and Hill, 75 King St, architects for proposed St. Oswald's R.C. junior mixed and infants' school. T.C. propose 62 dwellings, Western Approach Rd. Engineer.

Stamford T.C. Proposed: 40 houses for essential workers (£81,250).

Stewarton. Tender: 60 houses, Lainshaw site. Secretary, Special Housing Assen. Ltd., 19 Palmerston Pl, Edinburgh 12.

Stockton. Arndale Property Trust, Bank St, Bradford, propose £4 million redevelopment scheme to modernise High St.

Suffolk. £216,000 girls' grammar school proposed at Bury St. Edmunds.

Sunderland. David Glen Ltd., Albert Rd, Jarrow, contractors for proposed Penywell R.C. Primary School.

Wakefield. Shops/offices, Providence St, proposed by Fell Properties Investment Ltd. to plans by Fell Construction Co. Ltd., 20-30 Lawefield La.

Wandsworth and Woodford. B.C. propose £36,000 street lighting and conversion schemes.

Welwyn Garden City. Roche Products Ltd. propose £400,000 new production building; contractor: Harry Neale Ltd., 117 Baker St, W.1.

West Hartlepool. G. T. Brown and Son, 15 Grange Terr, Sunderland, architects for proposed £100,000 Mormon church.

Whitby. U.D.C. propose erection of 18 houses, plans by council architect.

Whittlesey U.D.C. Tender: 115 Holmeville houses, Delph St. Surveyor.

Wigton. N.E. Housing Assen., 5 Windsor Terr, Jesmond, Newcastle, propose 74 houses.

Wokingham. R.D.C. plan 101 flats in ten-storey block, Reading St.

Woolwich. Murray, Ward and Ptnrs., 32 Wigmore St, W.1, architects for proposed £158,820 boarding house at Crowns Wood School.

Worcestershire. A. H. Guest Ltd., Stourbridge, contractors for £324,940 teachers' training college, Bromsgrove.

Wrexham B.C. Tender: 66 Montgomery Rd dwellings. Borough Surveyor.

Gazette Announcements

COMPANIES ACTS

Carwood Electrical Supplies Ltd. Petition for winding-up to be heard before the High Court of Justice, Strand, W.C.2, on 31 July. Persons intending to appear to notify Cochrane and Cripwell, 119 Finsbury Pavement, E.C.2, by 4 p.m., 28 July.

Northern Phonographic Co. Ltd. and **Phonographic Operating Co. Ltd.** Meetings of creditors and contributories of the two companies to be held at Official Receiver's Office, Pearl Chambers, East Parade, Leeds 1, on 28 July, at 10.30 and 11 a.m., respectively, for Northern Phonographic and 11.30 a.m. and 12 noon, respectively, for Phonographic Operating.

George Pill Ltd. Mr G. C. Ehlers, 28 Baldwin St, Bristol 1, appointed liquidator at extraordinary general meeting on 4 July for the purpose of voluntarily winding-up.

Ryhope Electrix Ltd. Meeting of members and creditors to be held at Bank Chmbrs, 1 John St, W.C.1, on 15 Aug., at 3 p.m., for the purpose of having an account of the winding-up laid before them.

Airsonic Ltd. Meetings of members and creditors to be held at 31 King's Rd, Sloane Sq, S.W.3, on 21 Aug., at 9.45 and 10 a.m., respectively, for the purpose of having an account of the winding-up laid before them.

General Refrigeration Ltd. Mr L. M. Froude, 8 West St, Epsom, Surrey, appointed liquidator at extraordinary general meeting on 3 July for the purpose of voluntarily winding-up.

Phoenix Sales Ltd. Mr F. T. Snow, Thames Hse, Queen St Pl, E.C.4, appointed liquidator at extraordinary general meeting on 4 July for the purpose of voluntarily winding-up.

Companies Winding-up

F. and B. Electrics Ltd., 521 Staines Rd, Bedfont, Middx, electrical appliance retailers.

Statement of affairs presented to a recent meeting of creditors showed liabilities of £14,716 and the only asset appeared to be £620 due from a director.

The company was formed in 1959 with issued capital of £30. The directors at the date of the winding-up order were Mr E. A. Brimfield and Mrs J. L. Brimfield. No resolution was passed and the case was left with the Official Receiver as liquidator.

Voluntary Liquidation

Victoria Electrical Co. (Manchester) Ltd., 25 Blackfriars St, and 153 Oxford Rd, Manchester, dealers in vacuum cleaners and accumulators.

The recent meeting of creditors were informed of liabilities amounting to £8,114, of which £6,753 was owing to trade creditors, there were additional preferential claims which amounted to £3,679. Assets were estimated to produce £717. No provision had been made in respect of contingent claims by finance companies and no account had been taken of balances on retention funds in view of such claims.

The company was registered in January, 1939, with a nominal capital of £1,000, of which £170 had been issued. The directors, W. N. Hollingsworth and Jean Hollingsworth, attributed the failure of the company to declining turnover, Government restrictions on hire purchase finance, and inability to maintain an adequate sales force.

Creditors confirmed the voluntary liquidation of the company with Mr N. A. Armstrong, 47 Mosley St, Manchester 2, as liquidator.

BANKRUPTCY ACTS

Receiving Orders

Leeds. S. C. Aspell, electrical wholesaler, formerly carrying on business as A. and A. Supplies (Leeds) at 1-3 Cambridge Rd, Leeds 7. Receiving order dated 10 July.

Leicester. A. Taylor, electrical engineer, formerly carrying on business at 2 Havelock St, at 26a Asylum St and 42 Highcross St. Receiving order dated 11 July.

Nottingham. H. E. Turner, radio, television and electrical engineer, formerly carrying on business at 26 Outram St, Sutton-in-Ashfield. Receiving order dated 11 July.

Rochester. C. W. Boulton and I. G. Payne, formerly carrying on business in partnership as P. and B. Electrical Appliance Co. at 19 High St, Sheerness. Separate receiving orders dated 12 July.

Application for Discharge

High Court of Justice. C. T. Pratt, hardware and electrical fittings manufacturer, formerly carrying on business at 388 and 396 Essex Rd, N.1. Order made on 9 June on application for discharge: discharged subject to certain conditions.

Appointment of Trustee

Kingston upon Thames. W. E. Chappell, builder and electrical contractor, formerly carrying on business as Suval Construction Co. at Station Approach, Shepperton. Mr A. H. Milward, 6 Cavendish Court, 11-15 Wigmore St, W.1, appointed trustee as from 12 July.

Intended Dividends

Newcastle upon Tyne. N. W. Doidge and J. C. Stephenson, electrical contractors, formerly carrying on business as Doidge and Stephenson at 16 Coldwell St, Felling. Last day for receiving proofs for intended dividend: 1 Aug., by trustee: W. Armstrong, Clarendon Hse, Clayton St. West, Newcastle.

Guildford. G. R. Jacobs and C. J. Trevethan, television, radio and electrical retailers, formerly carrying on business as Dawn Electric Appliances, at 192 Stoughton Rd, Guildford, and lately at 226 Connaught Rd, Brookwood. Last day for receiving proofs for intended dividend: 28 July, by trustee: W. H. Hudson, 6 Lea Pale Rd, Guildford.

Dividends

Bristol. E. W. White, electrical contractor, of 5 Greenfield Rd, Southmead. Dividend per £: 10½d payable at Official Receiver's Office, 26 Baldwin St, Bristol 1, on 1 Aug.

Plymouth. D. Boulton, radio and electrical engineer, formerly carrying on business at Old Town Ave. Dividend per £: 4s payable at Official Receiver's Office, Royal Bldgs, St. Andrew's Cross, Plymouth.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons Ltd., 116 Chancery La, W.C.2.

Dudley of Oldham Ltd., 330 Middleton Rd, Oldham. Electrical installation contractors, etc. Nom. cap.: £100. Dirs.: Kenneth Dudley and Joyce Dudley.

Ekco Export Ltd. Exporters, importers, distributors, manufacturers and dealers in domestic radio receivers, domestic television receivers, etc. Nom. cap.: £1,000. Dirs.: to be appointed by subs. Subs.: Robert B. King and Philip G. May, 9-12 Cheapside, E.C.2.

Electron Co. (Loboro.) Ltd., 36 Baxter Gate, Loughborough. Manufacturers of and dealers in electrical and electronic apparatus, etc. Nom. cap.: £7,500. Dir.: J. W. Wells.

Electronic Control Eng. (Sales) Ltd., 206 London Rd, Burgess Hill. Nom. cap.: £1,200. Dirs.: Gawaine G. H. Baillie, Clive L. Sell, Jack E. Gayler and John Scanlon.

T. G. Goodchild (Electrical) Ltd., "Clovelly," Yew Rd, Burwell, Cambs. Nom. cap.: £100. Dirs.: Thomas G. Goodchild and Wm. H. Crossman.

Harleys (Preston) Ltd., 243a Torquay Rd, Preston, Paignton, Devon. Radio, television and electrical equipment dealers and service engineers, etc. Nom. cap.: £100. Dirs.: Gerald E. W. English and Mrs Josephine George.

Instrument Panel Services Ltd., 61 Carey St, W.C.2. Manufacturers and installers of and dealers in instrument panels, etc. Nom. cap.: £1,000. Dirs.: H. R. Beasley, K. M. Beasley and T. A. Marriott.

Lavail Electrical Services Ltd., Prudential Bldgs, St. Andrew's St, Cambridge. Nom. cap.: £1,000. Dirs.: Mervyn H. Lay and Roy W. Vail.

Microwave and Semiconductor Devices Ltd. Nom. cap.: £25,000. Dirs.: to be appointed by subs. Subs.: Mary K. Salter and Kathleen Sellars, 59-67 Gresham St, E.C.2.

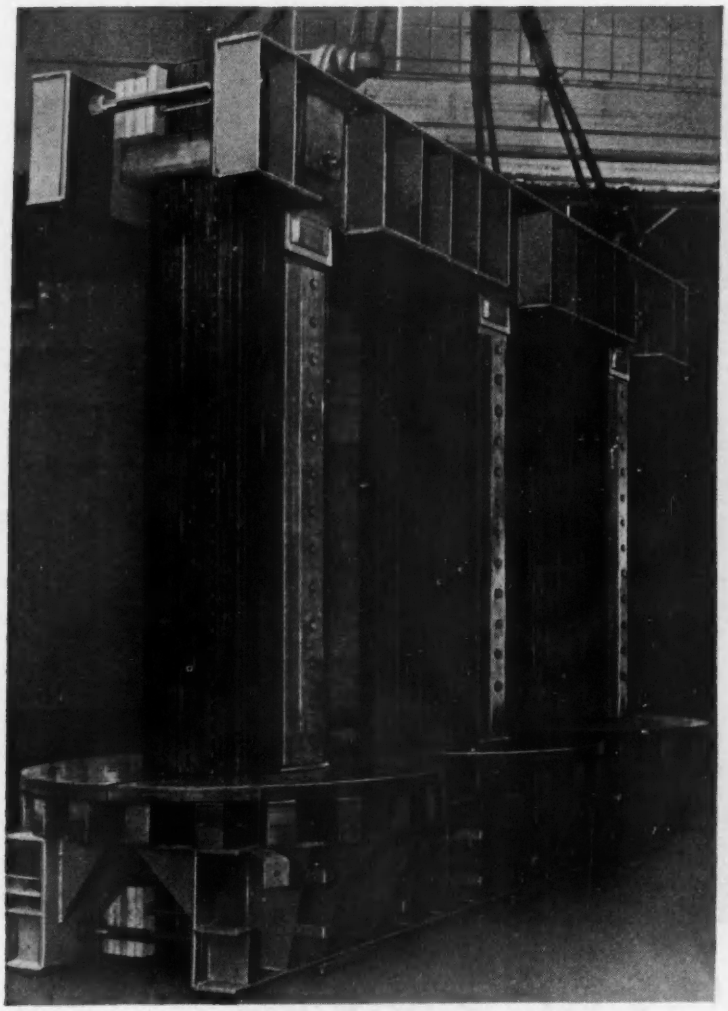
Power Motor Rewind and Repair Co. Ltd., Spurgeon St, Colchester, Essex. Nom. cap.: £8,000. Dirs.: Ivor B. Bull and Douglas W. Stow.

Radon Industrial Electronics Co. Ltd., Collonade Hse, 1 High St, Worthing, Sussex. To take over the business of electrical and electronic engineers carried on by Sigma Industrial Electronics at 53 Raleigh Cres, Goring-by-Sea, Sussex, etc. Nom. cap.: £200. Dirs.: Derek J. Brittain and John A. Clegg.

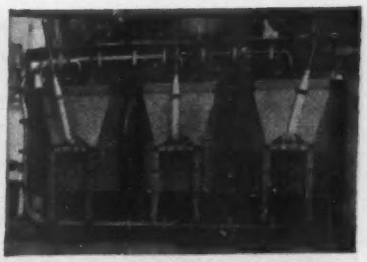
Roda Electrics Ltd., 20 Telford Ave, S.W.2. Electrical engineers, etc. Nom. cap.: £5,000. Dirs.: Frederick C. Mottram and Winifred D. Mottram.

Unigrind Ltd., 57 Windsor Rd, Slough, Bucks. Light and general engineers, model precision, mechanical and electrical engineers, etc. Nom. cap.: £100. Dirs.: Frank W. Hembury and Edward B. Buchholc.

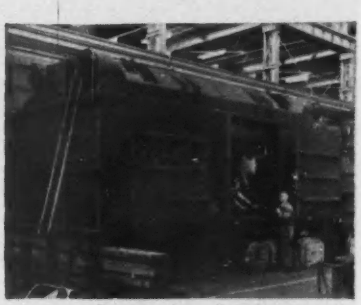
Wright and Son (Electrical) Ltd. Nom. cap.: £100. Dirs.: Ernest E. Wright, 80 King's La, Brentwood, Essex; and Kenneth E. Wright, Longways, Second Ave, Billericay, Essex.



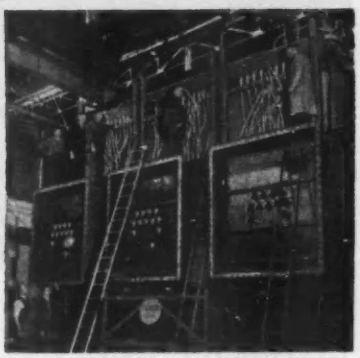
The finished core assembly of a 180 MVA 275/132 kV Hackbridge transformer showing the coil supports in position on the bottom clamping frames.



Core and coil assembly.

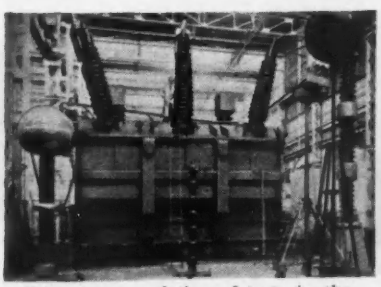


Preparation of tank.

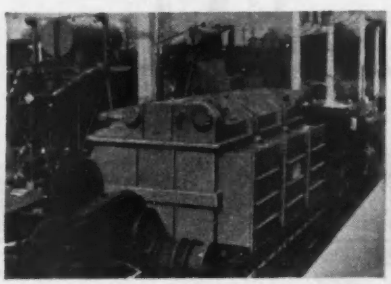


Lowering of core and coil assembly into tank.

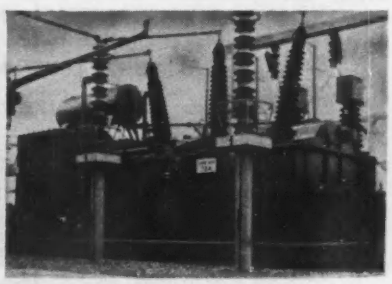
The Transformer Story



Following completion of tests in the Company's impulse testing laboratory.



Delivery to Central Electricity Generating Board super grid substation at Fleet, Hampshire.



In service. There are two 180 MVA and two 120 MVA 275/132 kV Hackbridge units at Fleet Substation.

HACKBRIDGE AND HEWITTIC ELECTRIC COMPANY LTD

HERSHAM · WALTON-ON-THAMES · SURREY

TELEPHONE: WALTON-ON-THAMES 28833 (8 LINES) TELEGRAMS & CABLES: "ELECTRIC, WALTON-ON-THAMES"

Ahead... right to the finish...

The external finish of the Sangamo Model S200 Meter is taken care of by Bakelite mouldings—proved by more than 25 years of complete satisfaction. The internal finishes reflect the tremendous care in the choice of materials and finishes which has made the S200 the most advanced Watthour Meter of the day. Quantity production in the world's most modern meter factory leads in turn to production economies which are passed on to the user in the form of finer materials, finer specification . . . in short, a better meter for the money.

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SW/76

CLASSIFIED ADVERTISEMENTS

TENDERS INVITED

BOROUGH OF HESTON AND ISLEWORTH

Rewiring of Electrical Installation Supplying and Fitting Power Points St. Aubyn's Avenue, Hounslow

TENDERS are invited for the rewiring of the electrical installation, supplying and fitting power points in 40 Council houses on the Warren Estate (St. Aubyn's Ave), Hounslow.

Forms of Tender to be obtained from the Housing Officer and Manager, Housing Department, Treaty Rd, Hounslow, Middx.

Tenders in sealed plain envelopes not indicating the Tenderer, endorsed "WARREN ESTATE—REWIRING" must be delivered to me by 10 a.m., on 21 Aug., 1961.

The Corporation are not bound to accept any Tender.

D. MATHIESON,
Town Clerk.

Town Hall,
Hounslow,
Middx. (B 462)

APPOINTMENTS VACANT

LONDON ELECTRICITY BOARD

SENIOR DRAUGHTSMAN

APPLICATIONS are invited for the above position in the Board's Southern District at 54 Bengeworth Rd, London, S.E.5.

Applicants should have had a good general and technical education and possess the Ordinary National Certificate or its equivalent and be capable of supervising Engineering Draughtsmen and other Drawing Office staff. They should also have had experience in building construction, including reinforced concrete design, be able to prepare working drawings and structural calculations in connection with the conversion of existing premises into transformer chambers, together with the layout of electrical equipment and cabling.

The post is graded under Schedule A of the National Joint Board Agreement as Class J, Grade 10, £1.090/£1,215 per annum, inclusive of London Allowance.

Applications stating age, qualifications and experience, should be sent direct to the Manager, at 54 Bengeworth Rd, S.E.5, within 14 days of the publication date of this notice. Please quote ref.: PER/V/3327/T. (B 498)

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

Vacancy No. 239/ET/61.

APPLICATIONS are invited for the superannuable N.J.B. appointment of ASSISTANT SHIFT CHARGE ENGINEER, Uskmouth "A" Power Station, West Nash, nr. Newport, Mon.

Salary: Schedule A, Class K, Grade 8, Scale 11, £1,275/£1,410 per annum, plus 10% shift allowance.

Applicants should possess H.N.C. or equivalent qualifications and have had operating experience in a modern power station.

Special application forms obtainable from Divisional Secretary, Central Electricity Generating Board, South Wales Division, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned by 12 Aug., 1961. (B 499)

THE EAST MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited from suitably qualified and experienced persons for the following appointments. Applicants should state age, qualifications, experience, etc., and quote the appropriate Vacancy No.

Derby and Burton Sub-Area

FOURTH ASSISTANT
DISTRICT COMMERCIAL ENGINEER
BURTON DISTRICT
Vacancy No. 90/61.

Salary: N.J.B. Class G, Grade 12, £765/£870 per onnum.

Duties will include assisting in the negotiations for the supply of electricity to agricultural. commercial, domestic and industrial consumers and the changeover of consumers' apparatus to standard voltage.

The successful candidate will also be required to supervise installation work and to advise consumers on tariffs, electrical installations and appliances, sales activities and general consumer service.

Applicants should preferably have received an engineering training and should have a good knowledge of the Board's tariffs, the I.E.E. Regulations and modern installation practice.

Ability to drive a car would be an advantage.

Applications stating age, qualifications and experience, previous and present appointments should be forwarded to the Manager, Derby and Burton Sub-Area, Electricity Offices, Irongate, Derby, in a confidential envelope endorsed "Fourth Assistant District Commercial Engineer—Burton," by 18 Aug., 1961.

Area Board Headquarters

FOURTH ASSISTANT ENGINEER
(TECHNICAL)
Vacancy No. 91/61.

Salary: N.J.B. Class BX, Grade 10, £935/£1.245 per annum, or Class BX, Grade 9, £1,005/£1,325 per annum, depending on the experience and qualifications of the successful candidate.

The duties of the post include assisting in the analysis and preparation of reports on the performance of the system and items of plant, and tests on various types of equipment.

Applications stating age, qualifications, education, experience, present and previous positions and salaries, should be addressed to the Chief Engineer, The East Midlands Electricity Board, Mapperley Hall, Nottingham, by 18 Aug., 1961. (B 486)

KENT EDUCATION COMMITTEE

Gravesend Technical College

APPLICATIONS are invited for the appointment of
ASSISTANT LECTURER (GRADE A)
for City and Guilds Electrical Installation and Electrical Technicians' Courses.

Candidates should be appropriately qualified with good industrial experience. Some teaching experience is desirable.

Salary scale: £520 x £27 10s—£1,000.

In fixing the salary increments may be allowed for industrial and/or professional experience.

Application forms and further particulars from the Principal, Technical College, Darnley Rd, Gravesend. (B 485)

SOUTH OF SCOTLAND ELECTRICITY BOARD

Fife Area

THIRD ASSISTANT ENGINEER

APPLICATIONS are invited for appointment as Third Assistant Engineer in the Construction Section, Area Headquarters, East Port, Dunfermline.

Applicants should have a good experience of all types of overhead line construction up to and including 33 kV.

N.J.B. conditions and salary, Class J, Grade 10 (Scale 8), £1,040/£1,165 per annum; post superannuable, subject to satisfactory evidence of health.

Applications on the standard form, obtainable from the Area Manager, South of Scotland Electricity Board, East Port, Dunfermline, should be returned to him not later than Saturday, 12 Aug., 1961. (B 484)

THE SOUTH WALES ELECTRICITY BOARD

ASSISTANT ENGINEER

APPLICATIONS are invited for the position of Assistant Engineer in the West Monmouthshire District (Bargoed) of the Monmouthshire and Mid-Wales Area.

Salary: N.J.C. Class H, Grade 9, Scale 8 (£1,040/£1,165 per annum).

Preference will be given to Engineers possessing the Higher National Certificate in Electrical Engineering.

Applications stating age, present position, present salary, qualifications and experience, should be addressed to W. E. Richardson, M.I.E.E, Manager, Monmouthshire and Mid-Wales Area, Llywelyn Rd, Cwmbran, Mon., so as to arrive not later than 15 Aug., 1961.

Please quote reference 94/61/ET, endorsing envelope "Assistant Engineer."

R. G. WILLIAMS,
Secretary.
(B 478)

YORKSHIRE ELECTRICITY BOARD

No. 6 (Hull) Sub-Area

SENIOR ASSISTANT ENGINEER
(COMMERCIAL)

APPLICANTS must be experienced in all matters relating to the administration and operation of a Sub-Area Commercial Department.

The duties of the post will include development of supply, utilisation, negotiations with large industrial and commercial consumers and generally to co-ordinate the activities of the Commercial Engineering Staff of the Sub-Area.

Salary: N.J.B. Class L, Grade 4 (Scale 16), £1,795/£1,950 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Hull, not later than 11 Aug., 1961.

No. 2 (Huddersfield) Sub-Area

THIRD ASSISTANT ENGINEER
(DRAUGHTSMAN)

Applicants should have a sound knowledge of Drawing Office practice, experience in the preparation of plant layout drawings, working drawings and wiring diagrams, and should be capable of supervising the Electrical Section of the Sub-Area Drawing Office, including Mains Records.

Salary: N.J.B. Class L, Grade 10 (Scale 10), £1,190/£1,325 per annum.

HUDDERSFIELD DISTRICT
FOURTH ASSISTANT DISTRICT ENGINEER

Applicants should have had experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems, substation plant and ancillary equipment.

Salary: N.J.B. Class J, Grade 11 (Scale 7), £965/£1,090 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 2 (Huddersfield) Sub-Area, Yorkshire Electricity Board, Market St, Huddersfield, not later than 11 Aug., 1961. (B 496)

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 46s. per inch, and all other classified advertisements at 3s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern Region

REGIONAL ELECTRICAL ENGINEER'S DEPARTMENT
TRANSMISSION PROJECT BRANCH
THIRD ASSISTANT ENGINEER
(DRAWING OFFICE)
SECTION LEADER—ELECTRICAL

APPLICATIONS are invited from Engineers who possess a Higher National Certificate and who have had a number of years' experience in a manufacturers' or other drawing office dealing with layouts and diagrams for H.V. grid substations for appointment as Section Leader (Electrical) in the Regional Electrical Department Drawing Office at Leeds.

The person appointed will be responsible for organising and leading a team of Senior and Engineering Draughtsmen engaged on interesting and varied work in connection with an extensive construction programme of reinforcement to the Transmission Grid System within the North Eastern Region. Previous applicants for this post need not re-apply.

The salary for this appointment will be in accordance with the National Joint Board Agreement, Schedule B, Grade 8 BX, £1,145/£1,410 per annum, and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from the Assistant Regional Secretary (Personnel), Central Electricity Generating Board, North Eastern Region, 1 Whitehall Rd, Leeds 1, to whom they should be returned to arrive not later than 9 Aug., 1961. (B 465)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

North Staffordshire Area

GENERAL ASSISTANT DISTRICT ENGINEER
(STOKE SOUTH)

Duties include assistance on the planning, construction and maintenance of H.V. and L.V. overhead and underground mains. Technical qualifications desirable. Salary: £825/£940 per annum (N.J.B. Grade G.11). Apply, by letter, within ten days, stating age, experience, present position and salary, to Mr C. C. Pimble, Area Manager, Midlands Electricity Board, 234 Victoria Rd, Fenton, Stoke-on-Trent.

South Staffs and North Worcs Area

FOURTH ASSISTANT ENGINEER
(METER AND SPECIAL TEST SECTION
AREA OFFICE)

Applicants should have a good knowledge of modern metering practice, be fully conversant with all types of H.V. metering equipment and be able to undertake site tests and maintenance. Technical qualifications desirable. Salary: £1,040/£1,165 per annum (N.J.B. Grade M.13). Apply, by letter, within 14 days, quoting ref. SS/T/526, stating age, qualifications, experience, present position and salary, to Mr D. Holt, Acting Area Manager, Midlands Electricity Board, P.O. Box No. 9, Toll End Rd, Tipton, Staffs.

F. W. CATER,
Secretary.
(B 473)

ADMINISTRATIVE COUNTY OF LEICESTER

ASSISTANT ELECTRICAL ENGINEER
£960/£1,310

CANDIDATES must be Associate Members of the Institution of Electrical Engineers or be in possession of the Higher National Certificate and be experienced in the design of electrical installations for all types of buildings. Removal expenses and lodging allowance may be paid to a married man. Apply on form available from the County Architect, 123 London Rd, Leicester. (B 10)

UNIVERSITY OF QUEENSLAND

Computer Centre

THE University has purchased a General Electric Computer (GE225) which is to be installed early in 1962 in a newly formed Computer Centre. Two initial academic positions have been established and applications are now invited for the position of:

READER IN COMPUTING

Salary: £A2,960 x £A60—£A3,200.

Applicants are required to have experience in automatic computation and numerical analysis, together with academic qualifications appropriate to the status of Reader and, as the appointee will be Officer-in-Charge of the Computer Centre, he must have some administrative experience.

The Reader will be responsible for the general management of the computer equipment, for consultation with users and the arranging of courses in programming techniques and numerical analysis at graduate and undergraduate level. For an interim period until the operational routine of the Centre is established, the Reader will be responsible to the Professor of Electrical Engineering, apart from the teaching of numerical analysis for which he will be responsible to the Professor of Mathematics. He will be expected to carry out and supervise research work.

The University will make arrangements for the appointment of a Lecturer in Computer Electronics who will be concerned with the reliable operation of the digital computer and ancillary apparatus.

The successful applicant will be entitled to participate in the benefits available to the academic staff which include F.S.S.U. type Superannuation, Housing Assistance, Study Leave and Travel Grants.

Additional information on the conditions of appointment, staffing and activities of the Department, together with application forms will be supplied upon request to the Secretary, Association of Universities of the British Commonwealth, Marlborough Hse, Pall Mall, London S.W.1.

Applications close, in Australia and London, on 4 Sept., 1961. (B 472)

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

FIRST ASSISTANT STATION CHEMIST

REQUIRED for Wolverhampton Power Station. N.J.B. service conditions, superannuable appointment, salary within Grade E9, £825/£940 per annum.

Applicants should preferably have experience in a Power Station Laboratory and possess the H.N.C. in chemistry. They should be familiar with sampling and analysis of coal, water and oil, and with the application of the results. Duties will include assisting the Station Chemist in the provision of satisfactory chemical services to the Station.

Apply, quoting Vacancy No. 193/61MD on form AE6, available from the Station Superintendent, Wolverhampton Power Station, Commercial Road, Wolverhampton. Closing date for receipt of applications is 9 Aug., 1961. (B 467)

GOVERNMENT OF ADEN

Public Works Department

ELECTRICAL AND MECHANICAL ENGINEER

QUALIFICATIONS: Candidates must be A.M.I.Mech.E. or A.M.I.E.E. with ten years' extensive experience in electrical and mechanical engineering.

Duties: To take charge of the Electrical and Mechanical branches of the Department and to advise the Director of Public Works on technical matters in those spheres.

Terms of Appointment: Contract for 18-24 months.

Total emoluments (salary and gratuity) in scale £1,677/£2,710.

Children's allowances. Free passages. Outfit allowance. Married quarters available at moderate rental.

Write Director of Recruitment, Colonial Office, London S.W.1, giving full names, age, qualifications and experience, quoting BCD 112/2/018/D10. (B 474)

NORTH BORNEO ELECTRICITY BOARD

ELECTRICAL ENGINEER

APPLICATIONS are invited for the above post on contract for one tour of three years. Salary according to qualifications and experience in scale (including Inducement Allowance) rising to £2,534 a year. Gratuity at rate of 15% of basic salary drawn for each completed year of service. Free passage. Liberal leave on full salary.

Candidates, under 45 years of age and preferably Corporate Members of the I.E.E., must be able to supervise staff engaged in installation and maintenance of Diesel generating plant, and capable of designing overhead and underground distribution schemes up to 33 kV. They should also be able to organise general office staff and departments dealing with tariffs and stores.

Apply to CROWN AGENTS, 4 Millbank, London S.W.1, for application form and further particulars, stating age, name, brief details of qualifications and experience and quoting reference M2A/51387/EE. (B 466)

UNIVERSITY OF LONDON

ASSISTANT ENGINEER

APPLICATIONS are invited to fill a vacancy under the Resident Engineer at Senate House. Qualifications should include a sound technical training to H.N.C., Mechanical or Electrical, and practical experience in the maintenance of heating, ventilating, air conditioning and general engineering services. Experience of electrode boiler thermal storage and H.P.H.W. systems would be an advantage. Present salary within the range £850 x 30—£1,000, plus benefits. Contributory pension scheme.

Write for further particulars and form of application to the Maintenance Officer, University of London, Senate Hse, W.C.1. Closing date for applications 30 Sept., 1961. (B 476)

CENTRAL ELECTRICITY GENERATING BOARD

Southern Project Group

DUNGENESS NUCLEAR POWER STATION

APPLICATIONS are invited from suitably qualified and experienced engineers for appointments at Dungeness Nuclear Power Station Construction Site. Experience in the supervision of construction of major engineering works and in the installation of power station plant would be an advantage.

SECOND ASSISTANT ENGINEER
(ELECTRICAL)
THIRD ASSISTANT ENGINEER
(ELECTRICAL)

To assist the Site Electrical Engineer in the supervision of the installation and commissioning of all electrical engineering plant.

THIRD ASSISTANT ENGINEER
(MECHANICAL)

To assist the Site Mechanical Engineer in the supervision of the installation and testing of mechanical engineering plant—conventional and nuclear.

Salaries will be within the following scales of the National Joint Board Agreement, Schedule "C":—

Second Assistant Engineer—Scale 15, £1,460/£1,830 per annum.

Third Assistant Engineer—Scale 13, £1,320/£1,610 per annum.

The successful candidates will be required to live in the vicinity of the site for the duration of the construction work, which will be up to four to five years. Opportunities will be available for transfer to future construction sites and associated design teams.

Applications stating age, qualifications, experience, present position and salary should be forwarded to the Administrative Officer, Central Electricity Generating Board, Southern Project Group, Squires La, Finchley, London N.3, to arrive not later than Wednesday, 9 Aug., 1961.

Envelopes should be marked "Confidential —ref. S/61/14."

T. YULE,
Chief Project Engineer.
(B 468)

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Region

East Midlands Division

SHIFT CHARGE ENGINEER
WARWICK POWER STATION
Vacancy No. 169/61.

APPLICATIONS are invited from qualified engineers for the position of Shift Charge Engineer at Warwick Power Station, Emscote Rd, Warwick.

Applicants should have had experience in the operation of steam turbine and boiler plant.

Salary will be in accordance with Class E, Grade 7 (£965/£1,090 per annum) of the National Joint Board Agreement plus 10% allowance for shift duties.

Closing date for receipt of applications: 4 Aug., 1961.

ASSISTANT EFFICIENCY ENGINEER
NOTTINGHAM POWER STATION
Vacancy No. 170/61.

Applications are invited for the position of Assistant Efficiency Engineer at Nottingham Power Station, Queens Drive, Nottingham.

Applicants should have held a position of responsibility in a modern power station and should have received a thorough practical and theoretical training.

Preference will be given to candidates who are Corporate Members of a recognised professional institution or who hold qualifications leading to such membership.

Salary will be in accordance with Class K, Grade 8 (£1,275/£1,410 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 4 Aug., 1961.

ASSISTANT SHIFT CHARGE ENGINEER
COVENTRY POWER STATION
Vacancy No. 171/61.

Applications are invited for the position of Assistant Shift Charge Engineer at Coventry Power Station, Alderman's Green, Coventry.

Applicants are required to take charge of shift operation of Boiler House plant and must possess a sound technical training, a good general engineering experience, and knowledge of the control and operation of water tube boilers, ancillary plant and the efficient combustion of Chain Grate Stokers.

Salary will be in accordance with Class G, Grade 9 (£965/£1,090 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 4 Aug., 1961.

SHIFT CHARGE ENGINEER
SPONDON POWER STATION
Vacancy No. 173/61.

Applications are invited for the position of Shift Charge Engineer at Spondon Power Station, Thulston Rd, Borrowash, near Derby.

Applicants should have had a sound training and considerable experience in a modern Generating Station.

Preference will be given to candidates who are Graduate Members of the Institution of Electrical or Mechanical Engineers, or who hold similar qualifications.

Salary will be within Class J, Grade 6 (£1,350/£1,500 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 11 Aug., 1961.

SHIFT CONTROL ENGINEERS
NOTTINGHAM POWER STATION
Vacancy No. 174/61.

Applications are invited for the position of Shift Control Engineers at Nottingham Power Station, Queens Drive, Nottingham.

Applicants should have had a sound training and practical experience in a modern Power Station. Possession of Higher National Certificate, or equivalent, will be an advantage.

Salary will be in accordance with Class K, Grade 10 (£1,115/£1,245 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 11 Aug., 1961.

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These appointments are pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Station Superintendent concerned and returned to him by the specified date.

O. S. WOODS,
Assistant Regional Director.
(B 487)

CITY OF SALISBURY, SOUTHERN RHODESIA

VACANCY FOR SENIOR ELECTRICAL ENGINEER

SALARY Scale £1,768 2s 6d x £51 5s—£1,921 17s 6d per annum.

Applications are invited for the position of a Senior Electrical Engineer on the salary scale £1,768 2s 6d x £51 5s—£1,921 17s 6d per annum, commencing salary at the minimum of the grade. No allowances are payable.

Candidates should possess a degree in Electrical Engineering or the equivalent, and/or be Corporate Member of the British Institution of Electrical Engineers, and have at least 15 years' experience in the design, erection and maintenance of indoor and outdoor substations, transformers, switchgear, protection, etc., up to and including 33,000 V. Experience on 88 and/or 132 kV equipment will be an advantage.

The selected candidate will be deputy and assistant to the Engineer in charge of the substation section of the Distribution Branch of an undertaking covering approximately 600 square miles and some 1,200 substations, with a present system maximum demand of 120 MW, but may be assigned to such other duties as requisite in the Distribution Section. Experience in general distribution work, and in the control of staff in an organisation of similar size, is essential.

GENERAL:

The successful candidate will be required to furnish to the Council a satisfactory medical certificate of fitness and to serve a probationary period of not less than six months, and if thereafter confirmed in his appointment, to join the Southern Rhodesia Local Authorities' Joint Pension and Widows' and Orphans' Fund.

Candidates must submit full particulars of their qualifications, training and experience giving details of positions held and salaries received. Age, nationality and marital state should be stated and copies of not more than three recent testimonials may be forwarded.

Particulars of the undertaking and a summary of conditions of service, pension and leave entitlements, etc., may be obtained from Messrs Merz and McLellan, Carliol Hse, Newcastle upon Tyne 1, to whom applications must be submitted on or before 18 Aug., 1961. (B 488)

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

ASSISTANT ENGINEERS (DISTRICT)

FOURTH Assistant Engineers required in Meaford (near Stoke on Trent), Bushbury (near Wolverhampton), Birmingham and Stourport Transmission Districts.

N.J.B. Agreement conditions, superannuable appointments, salary within Schedule B, Class CX, Grade 11, commencing at a figure commensurate with qualifications and experience. The salary range is £920/£1,245 per annum.

Candidates should preferably possess a Higher National Certificate in Electrical Engineering or equivalent qualification and should have had some experience in protective gear, metering or communications equipment.

Successful candidates will have opportunity for interchange of duties associated with E.H.V. Transmission Plant.

Apply, quoting Vacancy No. 189/61 MD on form AE6 available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, not later than 9 Aug., 1961. (B 483)

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT DISTRICT ENGINEER
CRAWLEY AND HORSHAM

SALARY within the range £965/£1,090 under N.J.B. Class F, Grade 8. Applicants should be suitably qualified and have had training and experience in the construction, operation and maintenance of underground and overhead distribution systems up to 11 kV. The successful applicant will be required to reside within the District and undertake standby duties. Subject to certain conditions housing accommodation will be available in Crawley.

Applications, quoting ET and naming two referees to District Manager, Seeboard, 50-52 The Broadway, Crawley, by 9 Aug., 1961.

ASSISTANT DISTRICT ENGINEER
MAIDSTONE DISTRICT

Salary under N.J.B. Class F, Grade 9, £890 x £25—£1,015 p.a. Superannuable. Applicants should have had a good general education, be technically trained to H.N.C. standard and have had practical experience in general distribution work on H.V. and L.V. systems. Knowledge of the preparation of system extension and reinforcement proposals an advantage.

Applications, quoting ET and naming two referees to District Manager, Seeboard, Fairmeadow, Maidstone, by 9 Aug., 1961.

SHOWROOM ASSISTANT (MALE)
CRAWLEY AND HORSHAM DISTRICT

Annual salary subject to age, qualifications and experience up to N.J.C. Grade 1, at present a maximum of £700 p.a. Duties will include general showroom work, advising consumers on the use of electrical apparatus. The appointment will be made at Horsham showroom, but the successful applicant may be required to work at times in the Crawley showroom. He may also be required to carry out relief cashier duties.

Applications, quoting ET and naming two referees to District Manager, Seeboard, 50-52 The Broadway, Crawley, by 11 Aug., 1961.

CHARGEHAND LINESMAN
(OVERHEAD POWER)
HASTINGS DISTRICT

Wages 5s 8½d per hour for a 42-hour 5-day week under N.J.I.C. Agreement. The successful applicant will be based at Parker Road Depot, Hastings, and will be required to carry out and supervise all work in connection with the erection and maintenance of overhead lines, distribution and service work up to 11 kV and equipment or apparatus associated with such work.

Applications quoting ET on forms from District Manager, Seeboard, 12-13 York Bldgs, Hastings, by 8 Aug., 1961.

GEORGE WRAY,
Secretary.
(B 490)

LONDON ELECTRICITY BOARD

ENGINEERING DRAUGHTSMEN

APPLICATIONS are invited for the above vacancies in the Engineering Drawing Office, at Lesco Hse, Stamford St, S.E.1.

Duties will include the surveying on site and constructional details in connection with the laying of E.H.V. Transmission Cables.

Candidates should have received a good general and technical education and possess the O.N.C. in electrical or mechanical engineering. They should preferably be not less than 22 years of age.

The posts are graded under Schedule B of the National Joint Board Agreement as Class BX, Grade 13, £820 per annum, rising to £1,065 per annum, inclusive of London Allowance.

Application forms obtainable from the Personnel Officer, 46 New Broad St, London, E.C.2, to be returned completed within 14 days of the publication date of this notice. Please quote ref.: PER/V/3366/T.
(B 495)

CENTRAL ELECTRICITY GENERATING BOARD
South Eastern Region
North Thames Division

APPLICATIONS are invited for the following appointment:

DIVISIONAL ELECTRICAL DEPARTMENT
(SYSTEM DEVELOPMENT SECTION)
DIVISIONAL HEADQUARTERS
COCKFOSTERS (NORTH LONDON)
THIRD ASSISTANT ENGINEER
SV. No. 1456.

Salary: N.J.B. Class AX, Grade 6, Scale 12, £1,285/£1,500 per annum, plus London Weighting £50 per annum.

The successful applicant will be required to assist in the preparation of system reinforcement schemes entailing the technical and economic appraisal of schemes and the preparation of reports.

A knowledge of network analyser practice, symmetrical component analysis and of the design of high voltage transmission systems would be an advantage. Applicants should have had a sound technical training and experience in this type of work and/or in the construction and operation of high voltage systems. They should preferably have qualifications in electrical engineering equivalent to corporate membership of the Institution of Electrical Engineers.

Applications, quoting Reference S.V. No. 1456, stating age, qualifications, experience and present position, should be sent to the Personnel Officer, Central Electricity Generating Board, South Eastern Region, North Thames Division, West Farm Pl, Chalk La, Cockfosters, Barnet, Herts, by 5 Aug., 1961. (B 494)

CENTRAL ELECTRICITY GENERATING BOARD
West Midlands Division

GENERAL ASSISTANT ENGINEERS

REQUIRED in the Site Maintenance Departments at Meaford "A," "B" and Stoke Power Stations. N.J.B. service conditions, superannuable appointments. Salary according to Class L, Grade 15, Scale 5, £825/£940 per annum.

Candidates should preferably possess a Higher National Certificate (Mechanical or Electrical), or equivalent, or be studying for one of these qualifications. The posts provide opportunities for gaining experience in plant operation and maintenance.

Applications quoting Vacancy No. 196/61 MD, to be made to the Station Superintendent, Meaford Power Station, nr. Stone, Staffs, by 9 Aug., 1961. (B 482)

SOUTH OF SCOTLAND ELECTRICITY BOARD
Lanarkshire Area

INSTALLATION ENGINEER
LANARK DISTRICT

APPLICATIONS are invited for the position of Installation Engineer from trained electricians capable of installing and testing all types of electrical installations and conversant with the Electricity Supply Regulations (1937) and the I.E.E. Regulations for the electrical equipment of buildings. Technical qualifications to Ordinary National Certificate or higher standard would be an advantage.

The salary and conditions of service for this appointment will be in accordance with the National Joint Board Agreement, Schedule A. The present classification and grading is E.9 (Scale 5); salary £825/£940 per annum. The post is superannuable.

Application forms, which can be obtained from the Area Manager, Montrose Cres, Hamilton, should be returned to this office within 14 days from the appearance of this advertisement. (B 492)

WHIPP & BOURNE LTD.

of Castleton, nr. Rochdale,

have a few vacancies in permanent pensionable positions for

DRAUGHTSMEN

Applicants should have a minimum qualification of O.N.C. and have good experience in a.c. and d.c. marine and industrial switchgear.

The factory is on the main A664 road between Manchester and Rochdale and there are excellent diesel and bus services between Castleton and surrounding towns, including Manchester. There are possibilities of promotion in the future after experience with the company.

Applicants should give brief details of age, qualifications and experience. They should be sent in writing to the Chief Draughtsman, Whipp and Bourne Ltd., Castleton, Rochdale, Lancs. (B 504)

THE NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited from suitably qualified engineers for the appointment of

THIRD ASSISTANT ENGINEER

Chief Engineer's Department, Planning and Development Section, at the Board's Headquarters, Carliol Hse, Newcastle upon Tyne. The duties will be to prepare schemes with technical reports for h.v. system extensions up to 66 kV. Experience of the layout of m.v. networks, short-circuit calculations and load flow studies will be an advantage.

Salary: Schedule B, Class BX, Grade 7, £1,235/£1,500 per annum. N.J.B. conditions of service.

Applications stating age, qualifications and experience to be received by Assistant Secretary (Establishments), The North Eastern Electricity Board, G.P.O. Box No. 117, Carliol Hse, Newcastle upon Tyne 1, not later than 11 Aug., 1961. (B 491)

THE NORTH WESTERN ELECTRICITY BOARD

FIRST ASSISTANT DISTRICT ENGINEER
CENTRAL DISTRICT, MANCHESTER

THE duties will include assisting in the planning, construction, maintenance and operation of the L.V. and H.V. networks, including substations, records, control of transport, etc. Applicants should have had a wide general experience on the distribution side of electricity supply, and be prepared to undertake standby duties. Corporate Membership of the Institution of Electrical Engineers will be an advantage.

Salary Scale: £1,535/£1,720 p.a. Grade J.4. N.J.B. Conditions.

SENIOR ASSISTANT
(SALES SUPERINTENDENT)
SOUTH DISTRICT, CHEADLE

Applicants should be experienced in the supervision of service centres, organisation of exhibitions, demonstrations and displays. The successful candidate will be responsible for domestic and commercial development and the supervision of staff engaged on that work. Ability to develop business is essential and preference will be given to applicants with technical qualifications.

Salary Scale: £1,150 x £30—£1,240 p.a. Grade 6. N.J.C. Conditions.

Applications on forms to be obtained from the Manager (Staff Vacancy), No. 1 Sub-Area, The North Western Electricity Board, Town Hall, Manchester 2, P.O. Box 493, and returned to him by 8 Aug., 1961. (B 464)

SIMON-CARVES LIMITED

require an

ASSISTANT ELECTRICAL ENGINEER

for work on Power Station Auxiliary Equipment, comprising selection of motors, starters, switchgear and cabling, control and interlocking schemes for steam raising plant and complete power stations.

The preparation of estimates, contract engineering and some site commissioning will be involved.

Applicants should have a sound technical background, including a recognised apprenticeship and be qualified to at least H.N.C. level.

Although experience of this type of work is desirable it is not essential, and suitably qualified applicants will be trained.

This is a permanent pensionable post carrying a commencing salary in the range £1,000/£1,500 per annum.

Send brief relevant details to:

Personnel Department,
SIMON-CARVES LTD., Cheadle Heath, Stockport, Cheshire,
quoting Ref. SC.40/5. (B 505)

UNITED KINGDOM
ATOMIC ENERGY AUTHORITY

require a

CONTROL ROOM TECHNICIAN

at

CHAPELCROSS NUCLEAR POWER STATION,
ANNAN, DUMFRIESSHIRE

to be responsible, on shift to the System Electrical Controller, for general duties in the electrical control room, including synchronising and loading of turbo-alternators, E.H.V. remote switchgear and meter reading.

A recognised engineering apprenticeship and some experience of power station electrical control rooms are essential. Possession of an O.N.C. or equivalent may be an advantage.

Salary between £750 (at age 21) and £1,060.

Staff Housing and Superannuation Schemes.

Generous holidays.

Send postcard for application form, quoting reference G.108/J.8., to Personnel Manager, at above address.

CLOSING DATE: 21 Aug., 1961. (B 479)

MORGANITE CARBON LIMITED

A Member of The Morgan Crucible Group

REQUIRE AN

Assistant Electrical Engineer

Age 25-28, with O.N.C. or better, in Electrical Engineering. He will work in the field of electrical installations for industrial sites, and this will include the development of automatic circuits and control circuits.

Salary in accordance with age and experience, Superannuation Scheme, Staff Canteen, etc.

Apply quoting ref. B.D./71 to:
The Staff Manager, Morganite Carbon Limited,
Battersea Church Road,
London S.W.11.

(B 460)

SENIOR ELECTRICAL DRAUGHTSMAN

required by

KODAK LIMITED

to work in its Project and Design Department. This department is a member of the Engineering Division where over 1,000 people are employed. Candidates should be experienced in the preparation of schemes and specifications for factory distribution systems. Qualifications up to H.N.C. or equivalent.

The company offers excellent employee benefits, including a profit sharing scheme, a voluntary part-contributory Life Insurance Plan and a Pension Scheme.

Please apply quoting JAW/7,
Mens' Personnel Dept.,
KODAK LTD. (FACTORIES),
Harrow, Middx.

(B 507)

ELECTRICAL ENGINEER

A Unilever Company requires an Assistant Electrical Engineer for Congo Plantations, to install, operate and maintain installations at factories and estates. Age limit 35 years. Candidates must have served an apprenticeship, followed by experience in some or all of the following: installation and maintenance of a.c. and d.c. generating plant, power plant, lighting installations, overhead and underground cable installations, M.T. and H.T. systems, telephones and electronic control equipment. He must possess ability to train and instruct African artisans on the estates. Minimum qualifications: Graduate A.M.I.E.E. or equivalent. Knowledge of French an advantage. Starting salary equal to between £1,700 and £1,850 according to qualifications, age and experience. In addition, there are family allowances, free accommodation and medical services.

Apply, in writing, stating age, education, qualifications and experience, to Box No. 8381, Electrical Times.

(B 475)

A well-known, progressive company, specialising in **HEAVY CAPITAL PLANT,** requires an

ELECTRICAL ENGINEER

conversant with up-to-date equipment and control gear for rolling mills and auxiliary machinery.

The position will be that of Assistant Chief Electrical Engineer; men up to 40 years of age are invited to apply, giving full particulars of education, previous and present employers; a salary commensurate with experience will be paid. Box No. 8379, Electrical Times.

(B 471)

Eastern Electricity

Northmet Sub-Area

GENERAL ASSISTANT ENGINEER, SUB-AREA CONSTRUCTION DEPARTMENT
(Ref. 4077)
167/61 R

Candidates should have had a sound technical training and be experienced to assist in the supervision of direct or contract labour employed on laying and jointing of all classes of cable up to, and including, 33 kV.

Salary: N.J.B. Class N, Grade 14, £1,090/£1,215, inclusive of London Allowance.

Apply by letter to the Manager, Northmet Sub-Area, Eastern Electricity Board, Northmet Hse, Southgate, London, N.14, by 11 Aug., 1961.

Suffolk Sub-Area

THIRD ASSISTANT ENGINEER (COMMERCIAL)
SUB-AREA HEADQUARTERS
170/61 R

Candidates should have received a good general and technical education and training. Have a sound knowledge of industrial electrical installations and the necessary experience to advise commercial and industrial consumers on the application and utilisation of electricity in their businesses, and be competent to assist in negotiating agreements for supplies of electricity to these consumers.

Possession of appropriate technical qualification would be an advantage.

Salary: N.J.B. Class K, Grade 10, £1,115/£1,245.

Apply by letter to the Manager, Suffolk Sub-Area, Eastern Electricity Board, Finborough Hall, Stowmarket, by 11 Aug., 1961.

CLACTON DISTRICT DEMONSTRATOR
169/61 R

Candidates should have had domestic science training, including electrical housecraft; should hold the E.A.W. Certificate, be competent to plan and give cookery demonstrations, including lectures, and help housewives to select, buy and use efficiently appliances most suited to their needs.

Salary: N.J.C. Grade 1, £600/£700.

Apply by letter to S. N. Boyne, A.M.I.E.E., Manager, Clacton District, Eastern Electricity Board, 56/58 Station Rd, Clacton-on-Sea, Essex, by 21 Aug., 1961. (B 480)

'ENGLISH ELECTRIC'

WHETSTONE, NR. LEICESTER

ELECTRICAL & INSTRUMENT ENGINEERS

Vacancies have arisen for Electrical and Instrument plant contract engineers to negotiate the procurement of electrical plant, instruments, cubicles and control gear for the Atomic Power Division. They will be required to negotiate within the Company as well as with sub-contractors, and will be required to act on their own initiative. Experience with Power Station auxiliary equipment, instrumentation or control gear (as appropriate) is essential.

Please write, giving details of previous experience and qualifications, to the

Chief Engineer,
c/o Dept. G.P.S., English Electric Hse,
Strand, London W.C.2,

quoting reference number ET 1897T.

(B 461)

'ENGLISH ELECTRIC'

STAFFORD

require an

ENGINEER FOR SILICON CONTROLLED RECTIFIER APPLICATION

The work comprises various applications of silicon-controlled rectifiers, and it includes the transistor gate control for them, their protection and overall equipment control. It offers a unique opportunity to an Electronics Engineer who would like to relate and apply his work to medium and very large power equipments.

The field of silicon-controlled rectifier application will extend far beyond that of mercury arc converters, including not only main power supply and control applications, but also the large field of static switching.

Applicants should preferably be of graduate level although H.N.C. (Elec.) with experience closely allied to this field will be considered.

This is a permanent and pensionable staff position and full details of conditions of service together with details of accommodation and removal assistance will be given at interview.

Applications should be made in writing giving full details to

Mr. J. D. McColl,
Chief Engineer Rectifier Department,
c/o Dept. G.P.S., English Electric House,
Strand, London, W.C.2.,
quoting reference number 1295Q. (B 506)

THE NORTH WESTERN ELECTRICITY BOARD

FOURTH ASSISTANT DISTRICT ENGINEER
OLDHAM DISTRICT

DUTIES include assisting with the operation, maintenance and construction of the distribution system, both underground and overhead up to 33 kV, including substations; standby duty. Applicants should preferably be suitably qualified.

Salary Scale: £890/£1,015 p.a. Grade H.11. N.J.B. conditions.

Applications on forms to be obtained from the Manager, No. 3 Sub-Area, The North Western Electricity Board, Union St, Oldham, and returned to him by 14 Aug., 1961. (B 489)

UNIVERSITY OF SYDNEY

NUFFIELD FOUNDATION RESEARCH FELLOWSHIPS
SCHOOL OF ELECTRICAL ENGINEERING

APPLICATIONS are invited for two positions of Nuffield Foundation Research Fellow in the School of Electrical Engineering. Candidates should be well qualified in Electrical Engineering or Physics with general experience in electronics and considerable detailed knowledge of solid state circuits. The successful applicants will be associated with the development of electrical engineering aspects of the design of a large radio-astronomy interferometer system under development by the Radio Astronomy Centre, a joint project of the Schools of Electrical Engineering and Physics. The main field of interest will be the application of solid state circuitry to radio-astronomy receiver systems.

In each case, the salary will be £A1,950 per annum and the appointment will be for a period of three years. No allowance will be made to appointees for their travelling expenses to Sydney.

Applications giving details of qualifications and experience and the names of three referees, should be forwarded to reach the undersigned not later than 30 Sept., 1961. In addition, overseas candidates are required to forward two copies of the application to the Secretary, Association of Universities of the British Commonwealth, Marlborough Hse, Pall Mall, London S.W.1, from whom further information may be obtained.

M. A. TELFER,
Registrar.

University of Sydney,
Sydney,
New South Wales,
Australia. (B 509)

THE SOUTH WALES ELECTRICITY BOARD

ASSISTANT CHIEF ENGINEER
(METERS)

APPLICATIONS are invited from Chartered Electrical Engineers with wide experience of all aspects of electrical metering, for the position of Assistant Chief Engineer (Meters).

The successful applicant will be responsible to the Chief Engineer for all matters in connection with energy metering and ancillary equipment. He will manage the new Meter Testing Station now under construction at Cardiff, where the repair and testing of all metering and ancillary equipment used by the Board will be centralised. Responsibilities will also include the commissioning and maintenance on site of all polyphase power metering equipments, a number of which are associated with very large loads and operate at voltages up to 66 kV.

The salary will be in accordance with Class B, Grade 6, of the National Joint Managerial and Higher Executive Grades Committee, namely, £2,170/£2,380 per annum.

Applications should be sent to the undersigned at St. Mellons, Cardiff, to arrive not later than 15 Aug., 1961.

Please quote reference 93/61/ET endorsing envelope "Assistant Chief Engineer (Meters)."

R. G. WILLIAMS,
Secretary.
(B 493)

LONDON ELECTRICITY BOARD

GENERAL ASSISTANT ENGINEERS

APPLICATIONS are invited for the above positions. Initially the successful candidates will be located at 84 Romford Rd, Stratford, E.15.

Applicants should have a sound technical education to the standard of the Higher National Certificate, and have completed a recognised period of training in the electricity industry, or have equivalent experience.

The posts are graded under Schedule B of the National Joint Board Agreement as Class BX, Grade 15, £725/£920 per annum, inclusive of London Allowance.

Applications stating age, qualifications and experience, should be sent direct to the Manager at the above address, within ten days of the publication date of this notice. Please quote ref.: PER/V/3110/T. (B 497)

NORTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD

CLERK OF WORKS
(ENGINEERING)

REQUIRED for supervision of site works in various establishments.

Applicants must have served an apprenticeship in mechanical or electrical engineering and have had not less than five years' experience supervising site installations. They must be capable of supervising both mechanical and electrical work.

Salary scale £800 x £40(5) x £50(1)—£1,050, plus £30-£50 London Weighting. Superannuable; Whitley Council conditions.

Apply, stating age, qualifications and experience, with names and addresses of two referees (preferably employers), to Secretary, North West Metropolitan Regional Hospital Board, 40 Eastbourne Terr, W.2, quoting reference 959, by 14 Aug.. (B 503)

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Applications for this post to be made on standard form AE6/ACT OBTAINABLE BY POSTCARD ONLY from the District Manager, South Western Electricity Board, 3 Bedford St, Exeter. Closing date for receipt of completed applications is 12 Aug., 1961. (B 481)

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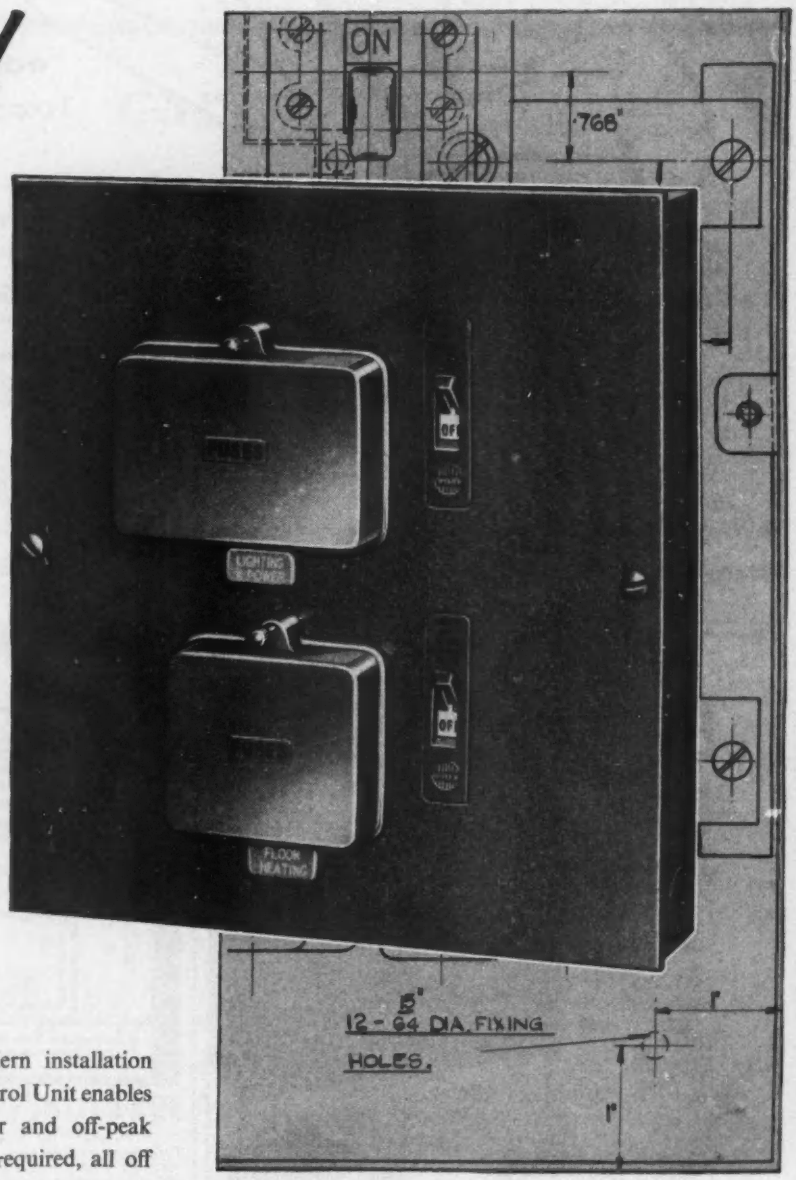

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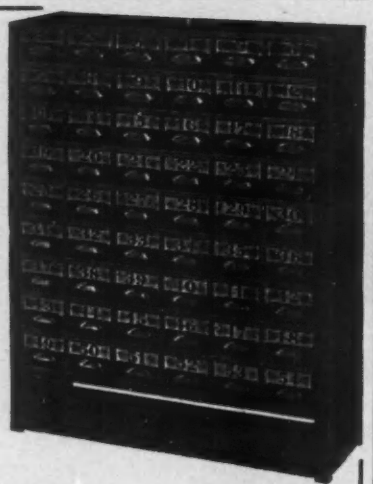

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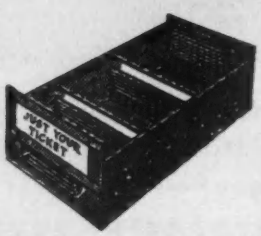

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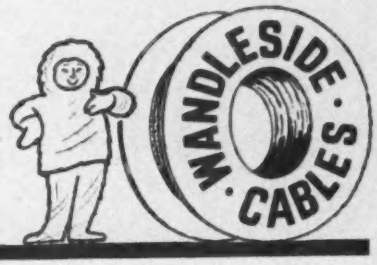

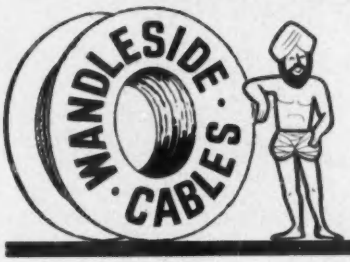

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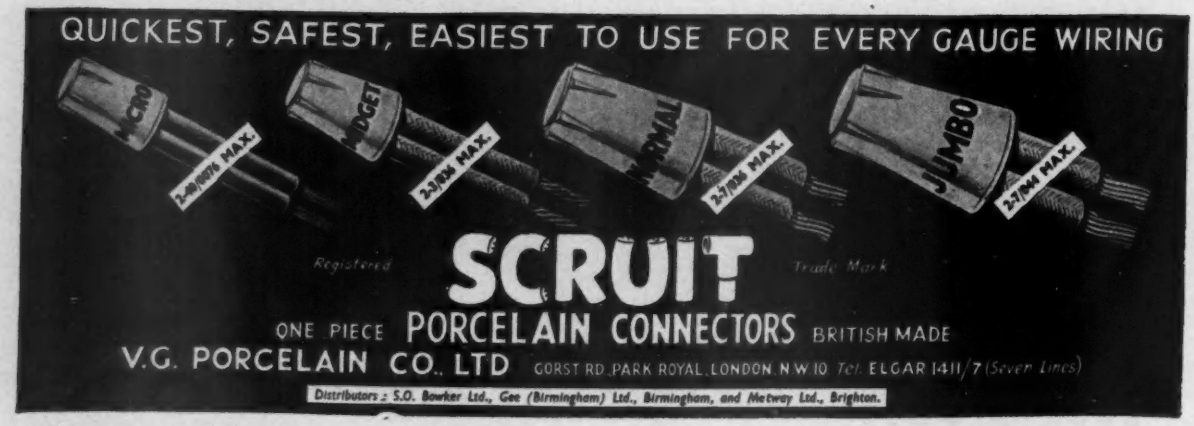

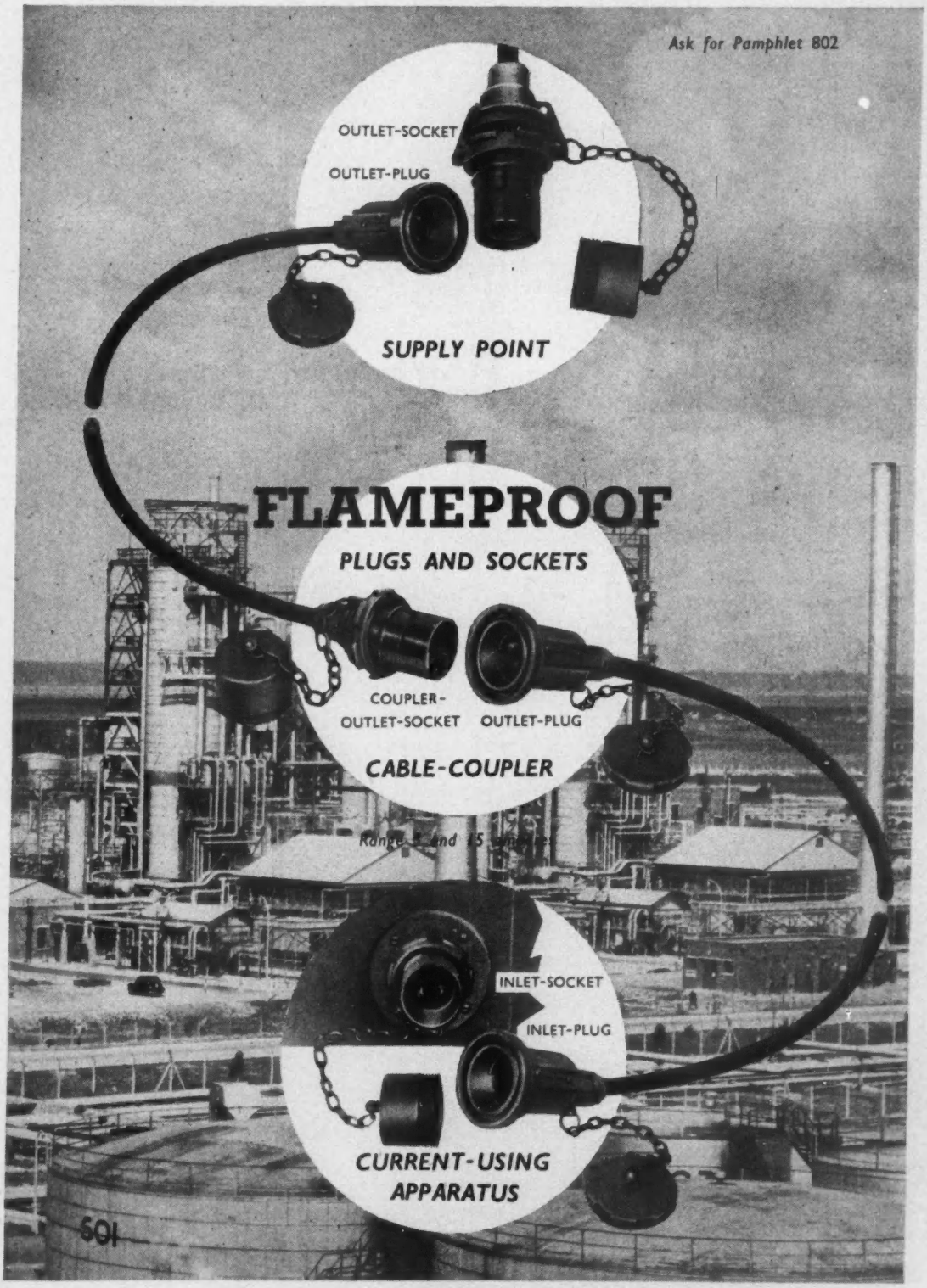

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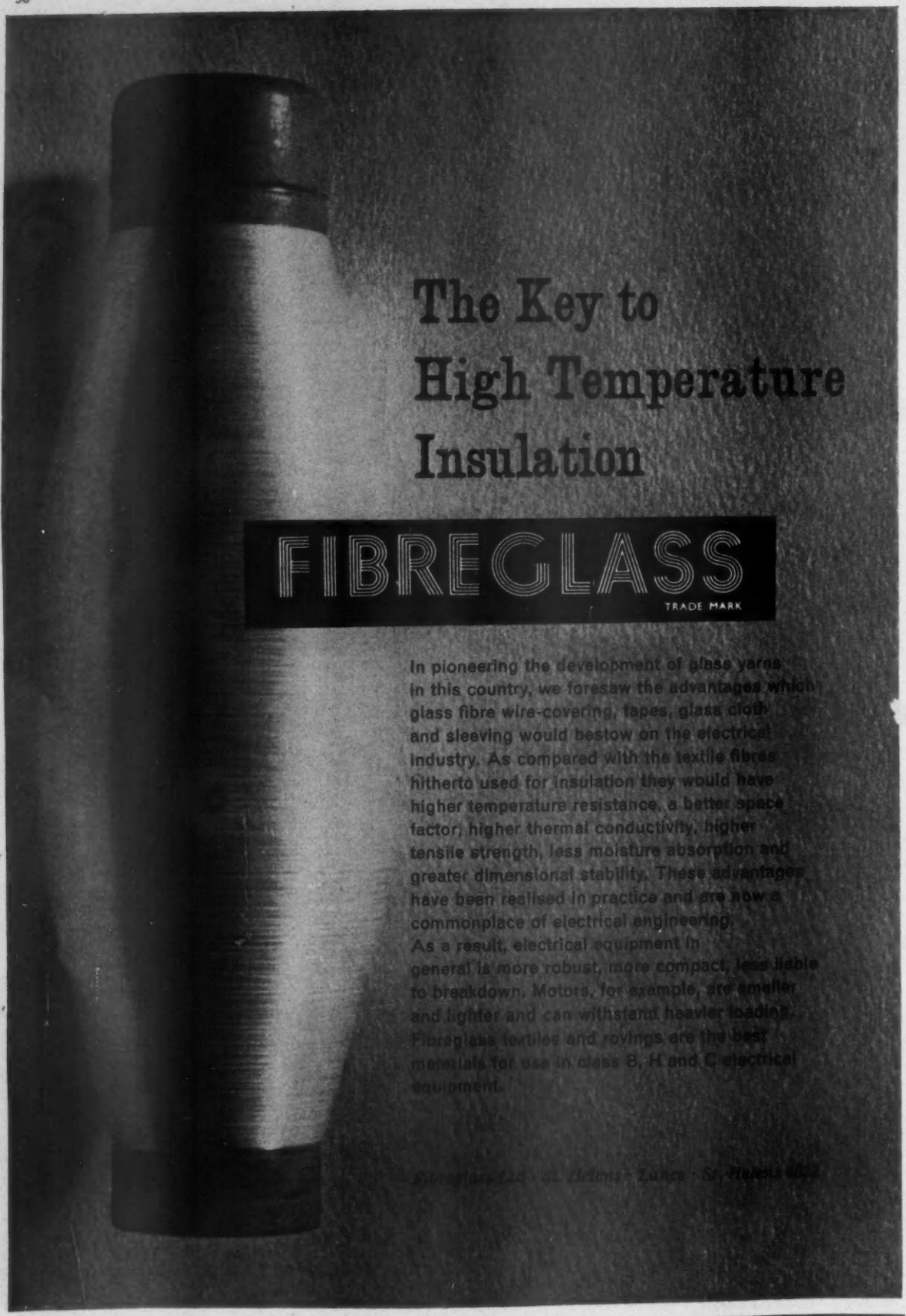
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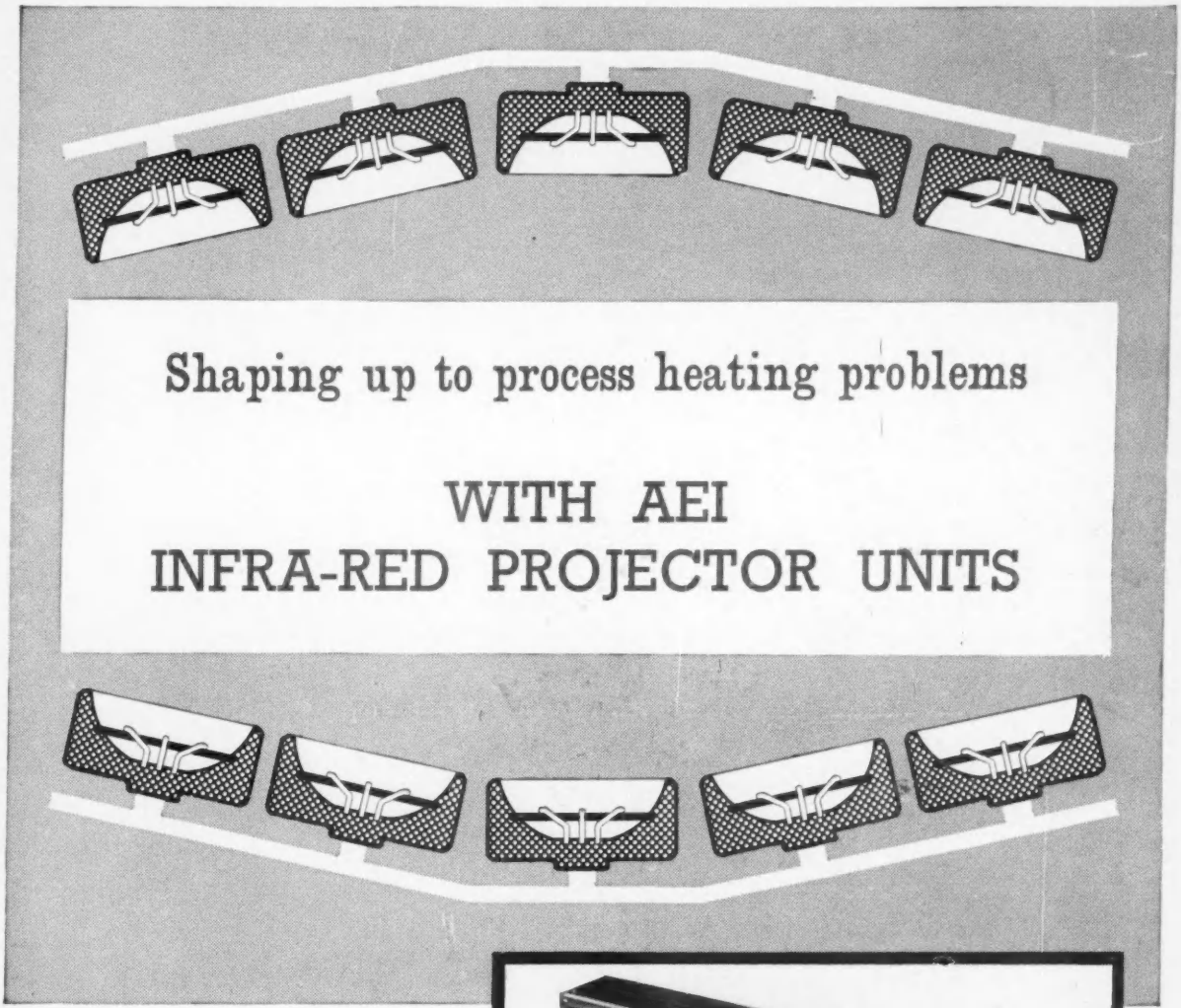

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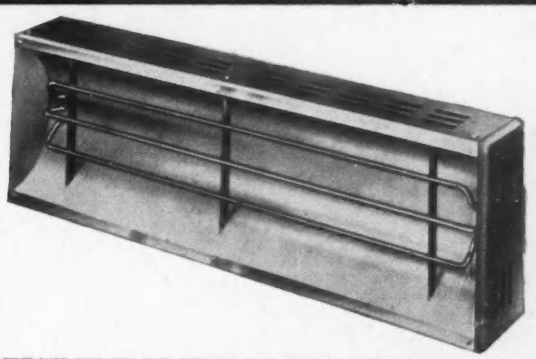

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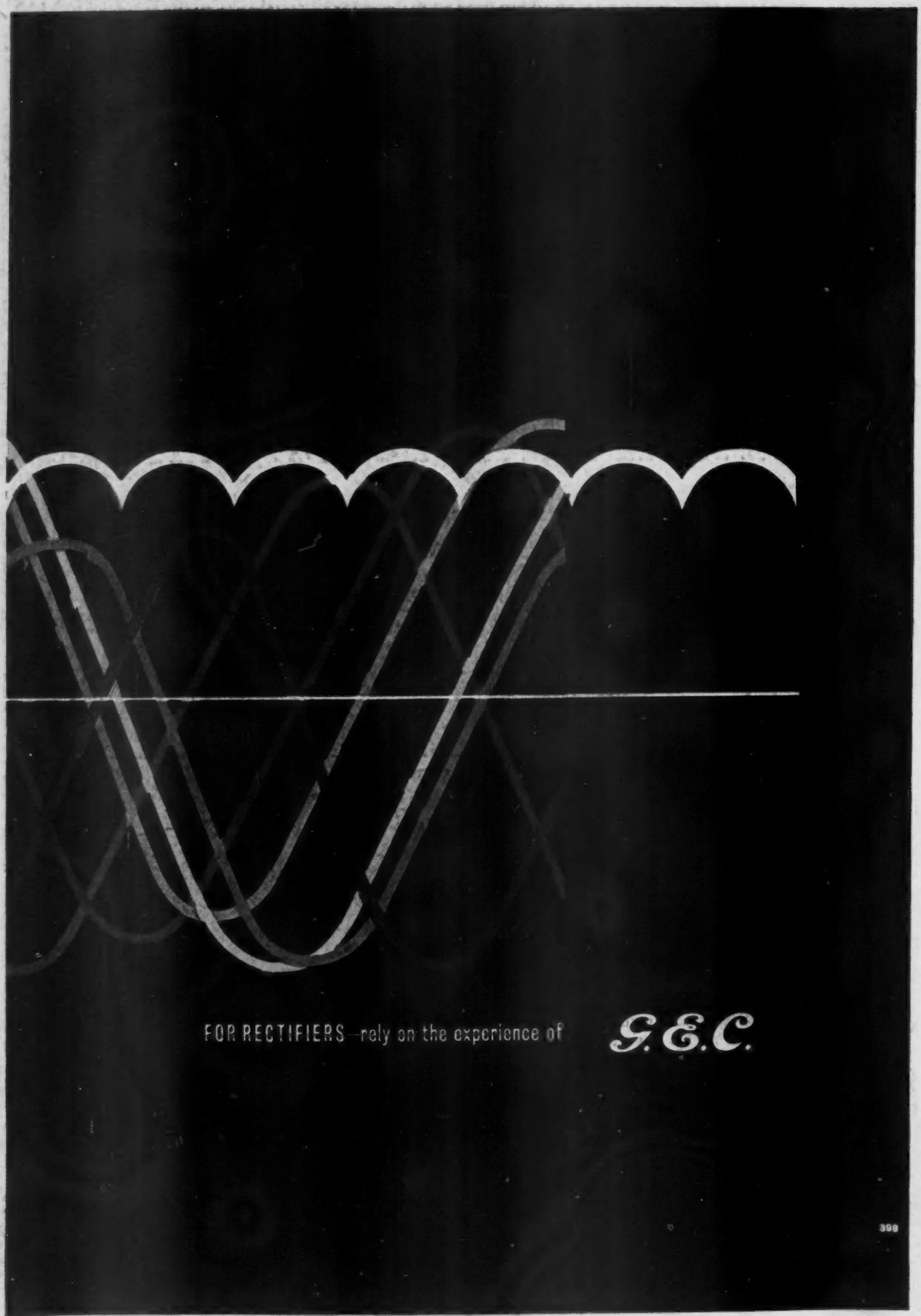
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